HOUSES, BOATS, AND FISHING IN THE SOCIETY ISLANDS

BY

E. S. CRAIGHILL HANDY

BERNICE P. BISHOP MUSEUM
BULLETIN 90

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INTRODUCTION

The studies presented in this paper are based on field investigations in the Society Islands in 1923. At that time every inhabited island of the group was visited, with the exception of Maiao.

Mr. Kenneth Emory, who is a more experienced student of material culture than the writer, in 1925, likewise, visited all the islands in the course of his archaeological survey. Consequently, when he returned to the Museum, he was in a position to amend and revise my manuscript. This he did most painstakingly, with the result that the studies herein contained, especially the description of house construction, have been made more accurate and, in many instances, more complete. For his cordial cooperation and assistance I offer my sincere thanks.

HOUSE BUILDING AND HOUSE FORMS

TERMINOLOGY

The native terms applied to types of houses erected for various purposes, and for the different parts and elements that enter into the material equipment and appurtenances of houses, are listed as follows:

Types of Houses

Farau.	Hangar.
Farau va'a (or farau poti, farau pahi).	Canoe or boathouse.
Fare.	General term for house.
Fare rau or pora.	Small shed or shelter.
Fare tutu.	Cook house.
Fare tupapa'u.	Shed for corpse.
Fare oa.	Chief's portable house.
Fare atua.	Portable shrine.
Fare taoto.	Sleeping house.
Fare haupape or hau paru or hau ti'a.	Having straight ends.
Fare taupee.	Arch-ended Leeward Island type, or modern type with flat sloping-end roof.
Fare ni'au.	House thatched with coconut leaf mats.
Fare rau oro.	House thatched with *Pandanus* leaves.
Fare aretu.	House thatched with grass.
Fare taua.	House on piles.
Fare potee or potaa.	House with aspidal ends.
Fare aito.	Warrior's house.

Fare ari'i.	Chief's residence
Fare apo'oraa or putuputuraa.	Assembly house.
Fare arioi.	Arioi house.
Fare heiva.	Theater.

Modern terms

Fare haapiiraa.	School.
Fare himene.	Hymn-singing house.
Fare hau.	Government house.
Fare pureraa.	Church or prayer house.

Frame

Aho.	Rafters.
Apo'o.	Post hole.
Fa'a-eta-eta.	Purlin.
Faufau.	Floor poles (Leeward Islands).
O'a.	Principal rafters supporting ridgepole in farau and some cookhouses.
Patini.	Horizontal rods to which the vertical rods of the house wall are lashed.
Pae.	Front and rear crossbeam of *fare hau pape*; ground sill of floor frame (Leeward Islands).
Pae rape.	Ground sill.
Piriti.	Oblique brace.
Potee.	Round end.
Pou.	Post.
Pou poto.	Short side and end post.
Pou tahuhu.	Posts supporting ridgepole, king-post.
Pou tino fare.	Side posts.
Ra'au eta-eta.	Oblique brace.
Ra'o.	Floor beams or sleepers.
Rape.	Plate.
Tahuhu.	Ridgepole.
Tamaru.	Veranda.
Taumi.	Heavy pole laid against outside of roof thatching during high winds.
Taupee.	Arched or straight sloping end. Called *taupepe* by some of the natives on Maupiti.
Te'a or te'ate'a.	Crossbeam.
Te'a aho.	Brace in gable of canoe house.
Tino fare.	Main middle section of *fare potee* or *taupee*.
Toro-toro 'iore, toro-'iore, or koko-'iore.	Upper ridgepole; eaves batten.
Turu.	Supporters for ridgepole used in hangars.
Turu tahuhu.	Braces (Raiatea).

Thatching and Lashing

Aeho.	Papyrus stem used as base of *rau oro* thatch mat.
Ato.	To bind thatch.
Au (aeho or rau oro).	A thatch mat made of *Pandanus* leaves.
Hau ato.	Needle.
Hono.	A section of thatching.
Ieie.	Runners of *ieie* (*Freycinetia*) used for lashing.
Iri purau.	Bark of *purau*, strips of which are used for lashing.
More.	Bast of *purau*, used in making cord.

Nape.	Sennit.
Ni'au.	Thatch mats made of coconut leaf.
Ni'au maro.	Thatching made of coconut leaflets attached to bamboo rods.
Ofati.	Binding *Pandanus* leaves on supporting rod to make thatch mats.
Patia tapoi.	Pins that hold fast the thatching on the ridge.
Puee.	Process of flattening *Pandanus* leaves.
Rau oro.	*Pandanus* leaves, single thatch mat made of them, or *Pandanus* leaf thatch.
Tapoi.	Ridge thatching.
Taura.	Rope or cord.
Taura nino.	Twisted or spun cord.
Tui.	To sew on thatch.
Tui rau oro.	Thatching needle, or awl for making holes in *rau oro.*
Uiau.	*Pandanus* thatch when used on the ridge.

Measurements

Eta-eta.	One arm span (one fathom).
Umi.	Ten arm spans.
Tihope.	Two hundred thatch mats.
Hono.	The length of the rod used in making the thatch mat of *Pandanus,* measured from the crooked elbow to the extremity of the opposite hand.

Miscellaneous

Ahu taoto.	Bed sheet of tapa.
Amuna.	Doorway (old Raiatean term).
Ana-ana.	Pebbles used on yards.
Aretu.	Grass used on the floor.
Aturu.	Posts supporting Leeward Islands' type floor frame.
Aumoa.	Fence.
Fata.	Posts on which possessions, etc., were hung.
Moe'a.	Sleeping mat.
Niu.	The stones or tree trunks set around the outside, or just under, the walls of a house. Stone supports for floor frame.
Opani.	Door (modern).
Oro'a hao-ra'a fare.	Feast of house-entering.
Paepae.	Platform or terrace.
Paepae ofa'i.	Stone terrace.
Paepae ra'au.	Wood platform.
Parahi-ra'a (nohora'a, or iri).	Wooden seat with legs.
Paruru.	Screen suspended on a frame.
Patia (or atia).	Upright rods used for walling.
Paua.	Mat screens.
Rara'a.	Woven split bamboo.
Uputa.	Door (modern).

MATERIALS

Before detailed description of the construction of the several types of native dwellings is entered upon, it will be well to mention the materials that were most commonly used for the different parts. The superior woods—those best for posts, plates, crossbeams, rafters and ridgepoles—are breadfruit, coconut, *miro* (*Thespesia populnea*), *tou* (*Cordia subcordata*), *ahi'a* (*Eugenia malaccensis*), *mara.* Ironwood was anciently used for posts, and is now sometimes employed for rafters, rods and braces. For the heavy beams, such as the ridgepole and the tiebeams in large assembly houses, the woods most used nowadays are coconut and breadfruit. *Purau* is invaluable to the carpenter for many uses, but is not durable enough for posts, nor strong enough for long timbers. But it serves for plates, rafters, struts, rods, and walling. This wood has to be soaked in salt water for several days before it is used; otherwise it will soon be riddled by insects. Bamboo serves for many of the same uses as *purau,* namely, rafters, rods, and walling; but in addition ti is also used in making the *Pandanus* thatch mats, walls, and floors. For thatch, coconut and *Pandanus* leaves, and *aretu* grass (*Andropogon* sp.) are used; and for lashing, strips of *purau* bark (*iri purau*), and cord made of twisted or plaited *purau* bast (*more*) or coconut fiber.

SUBSTRUCTURES

The variation in type of substructure of houses in different sections of the Society Islands appears to be subject to rough classification. For the floors of sleeping houses throughout the group there are four methods of treatment: In the first there is no elevation, the floor being at ground level; in the second is used a low earth, stone, or rubble elevation or terrace encased in a dry stone wall roughly built in most of the sites observed; the third type—typically a Raiatean form, but also found in Tahaa and Borabora—consists of a wooden platform built as a unit that is distinct from the house or roof frame itself; the fourth type appears at first glance to be the same as the third, but in it the elevated floor, instead of standing upon its own distinct set of posts, is lashed to the side posts of the house frame. This type is confined to Huahine.

The first type mentioned, that in which the house rests directly on the ground, is found throughout the coastal region of Tahiti and Moorea, and was typical also of the seaside dwellings of the Leeward Islands, excepting Maupiti. The use of the *paepae,* or stone terrace is typical of Maupiti and the interior of all the islands, where the steepness of the ground necessitates more or less levelling to accommodate a house, the floor of which is of earth or stones strewn with grass.

Emory feels certain that the two forms of elevated floors now seen in dwellings have come into existence since the advent of the missionaries and

very likely as a result of their influence. Houses built on piles over water have become increasingly popular, as they are refreshingly cool and largely free from vermin. The larger part of the dwellings in Huahine villages are set in part or entirely over the lagoon and are connected with the shore by a stone causeway, coconut tree trunk, or a bridge of short poles laid across two parallel beams supported on posts. There is no mention by early voyagers of houses set out over the water and the early illustrations show only houses set back from the shore and directly on the ground. This is seen, for example, in the view of the bay at Fare, Huahine, in Cook's last voyage (6, Pl. 31 [1]). Emory points out that this evidence is also supported by accounts of Tyerman and Bennet (26, vol. 1, p. 236), and Ellis (10, vol. 2, p. 339), who described the situation of houses in the Leeward Islands, indicating that they saw none other than floors consisting of the ground or surface of a terrace or *paepae*. Dupetit-Thouars (24, Pl. 58-60) shows three views of Huahine houses; none with elevated floors.

In considering the question of the existence in ancient times in the Society Islands of a style of house elevated on posts it is perhaps worth bearing in mind the fact that in Hawaii, the Marquesas, and New Zealand there was a special form of house, the floor of which was elevated on posts, and which was used respectively for eating, men's activities, and food storage (all tapu for one reason or another), but never as a sleeping house (*fare taoto*) or dwelling, which, by reason of harboring women, was a profane place. These elevated houses were always tapu. There is a record (26, vol. 1, p. 282) of a form of sacred dwelling in Huahine that was elevated on posts. "On the north of the marae [of Tani at Maeva] was Tani's house, a little wooden chamber, built on posts, twenty-five feet high, and to which there was no access except by climbing one of them."

It seems, then, that the sleeping-house on posts or piles is a modern innovation, but that there existed anciently, in Huahine at least, a counterpart of the old Polynesian tapu house elevated on posts.

The large assembly houses of coastal Tahiti appear, in recent times, always to have had a curbing round the edge of the floor, practically flush with the side walls, made of boulders laid in mortar. The use of mortar is of course post-European, and I was led to suspect that for coastal Tahiti the use of the curbing is also, for I have found no mention by any early visitor to Tahiti of any curbing or elevation of the floor of the larger assembly houses, of chiefs' houses, or private dwellings. Emory, however, informs me that at ancient village sites in the interior of Opunohu valley, Moorea, he has seen curbstones outlining a *fare potee,* and also at a number of places at Maeva, and elsewhere on Huahine, so that at least the use of curbstones

[1] Numbers in parentheses refer to Bibliography, page 111.

forming an outline coinciding with the outside of the walls of a round-ended house is not foreign to ancient Society Island culture, although the raising of the level of the earth within may be.

The *fare putuputuraa* at Maupiti, shown in Plate III, has a curbing of cut coral blocks, thus following the Tahitian style, except that in Tahiti boulders are used instead of coral blocks, rather than that usual at present in the Leeward Islands where the assembly houses are usually elevated on posts.

The *fare putuputuraa* at Maeva, Huahine, is built in the usual Leeward Island style, but it represents an exception to the rule that Huahine houses have their floors lashed directly to the posts that support the roof. However, the building of a separate structure or frame to support the floor of so extensive an area would appear to be an inevitable necessity in these larger houses elevated on posts. Of this more will be said in the description of the large assembly houses.

The omission, by early visitors, to mention the elevation of the floors of houses in Tahiti and the Leeward Islands is, to me, plain evidence that the habit of placing the floor practically at ground level (Pl. II) was the general rule in coastal Tahiti, Moorea, and also in the Leeward Islands, in pre-European times. It is still the general rule for the *fare hau pape,* which is the only old style of house in Tahiti and Moorea today, excepting sheds and similar small structures.

In the *fare hau pape,* and in the better-constructed *fare tutu,* hewn logs cut to lie snugly on the ground in the spaces between the roof posts are now commonly used to form a ground sill (*niu*), usually made of coconut logs; but this usage, now associated with the closing of the sides of the house in the European style by means of *purau* poles, bamboo, or *aeho,* may represent a recent innovation, for Ellis (10, vol. 1, p. 174), specifically describes the stakes as being planted in the ground. Emory, however, accepts the ground sill as old, pointing out that the term *niu* is the ancient word for coconut, and that the same function is served by the stone curbings which he has found to be pre-missionary. "The surrounding of the outside of a house with a curbing of oblong stones set on edge and imbedded in the ground just outside the walls, is undoubtedly an original practice: it was observed at a house on Maupiti, and the outline of curbstones has been seen at numerous ancient village sites."

The typical, stone-encased house platforms of interior Tahiti (Pl. I, *B*), as I have seen them, are terraces built to equalize the natural slope of the land on which it was desired to build a house, generally made of earth, faced with rough blocks of stone or boulders. They never show evidence of skill comparable to that typical of the Marquesas. Terraces such as are described have been observed by me in the interior of several of the valleys of Tahiti and on Tetamanu plateau above Punaruu. The

largest and most numerous terraces observed in 1923 were, however, at Apootaata, above Faatoai, Moorea (Pl. I. *B*). On this island I was told that there were many similar terraces farther up in the same valley, and that such exist also around the lower slopes of the back walls of the great ancient crater that forms the major part of north Moorea, as well as in the interior of other large valleys such as Afareaitu. The description of such ancient village and house locations comes naturally under the subject of archaeology, and the reader is, therefore, referred for detail concerning these to the archaeological report on the Society Islands by Emory who, in 1925-6, located and studied in detail many such sites not only in Tahiti and Moorea, but also in the Leeward Islands (11).

Only in one locality in Tahiti, in the district of Pueu, have I seen a dwelling near the sea built upon a *paepae*. The terrace in this case had the form of a *fare potee,* oblong with round ends, and was faced with a curbing after the style of the Samoan house foundations. It may have been the site of one of the small assembly houses, which were built in low platforms. In Paea, also, not far from the sea, a small house stood on a little *paepae* of stone near the stream. These two houses were noted as exceptions to the rule that *paepae* are conspicuous by their absence in the coastal region of Tahiti.

Noting their absence in coastal Tahiti, their presence in the interior of the island and inland on Moorea, and their rarity in the coastal regions of the Leeward Islands (with the exception of Maupiti, where the coastal region is negligible), Emory (11) makes the following pertinent observation regarding *paepae* or terraces:

> To me it has only this interpretation, that the Society Islanders were stone *paepae* builders by necessity and not by preference. With a few exceptions, in the Leeward Islands, stone platforms were not erected where they were not necessary.

In ancient times on Maupiti, the typical house foundation was a stone-faced terrace. Such a *paepae,* one that was in use at the time of our visit, is shown in Plate VII, *B*. I was told here that this, the *paepae ofai* (stone platform), was the true old Maupitian form of foundation, while the *paepae raau* (wood platform), was the old Raiatean.

In the Leeward Islands a few interesting examples of rectangular foundations have been observed, near the seashore. These suggest, in form and construction, marae elevations rather than house platforms: but they were the sites of dwellings. On Huahine, near the road between Fare and Puaoa, there is a large, low, rectangular earth terrace faced with a curbing of small basalt slabs. This, I was told, was an ancient house site. I doubt whether it is more ancient than the missionary occupation, which initiated drastic changes in Huahine house building. After seeing this site, it was

interesting in going on to find near Puaoa a small inhabited native dwelling, standing on a miniature replica of this terrace, rectangular, earth-filled, and faced with a basalt curbing. Elsewhere on Huahine, at two other widely-separated sites, Emory (11) has observed large rectangular earth platforms faced with stone slabs set on edge; and one such foundation was seen in Tahaa. The substructure upon which used to stand the house of the chief, now the site of the government school of Tevaitoa, Raiatea, was of this form. It is a large rectangular terrace about 130 feet long by 45 feet wide, faced with small uncut basalt slabs from one to two feet high (Pl. I, *A*).

The *paepae raau* (wooden platform) built as a unit distinct from the house frame, is typical both of the dwellings and large community houses in Raiatea, Tahaa, and Borabora.

The fourth method of treating the floor, the method that was typical of Huahine, in which the floor rafters were lashed upon the side posts of the house instead of being part of a separate *paepae raau,* will be described on page 21.

Fare Hau Pape

First may be described what is the simpler, and probably the older, type of frame used for dwellings in Tahiti, that of the *fare hau pape.* The erection of the frame will be described step by step, and the parts numbered as they are in figure 1.

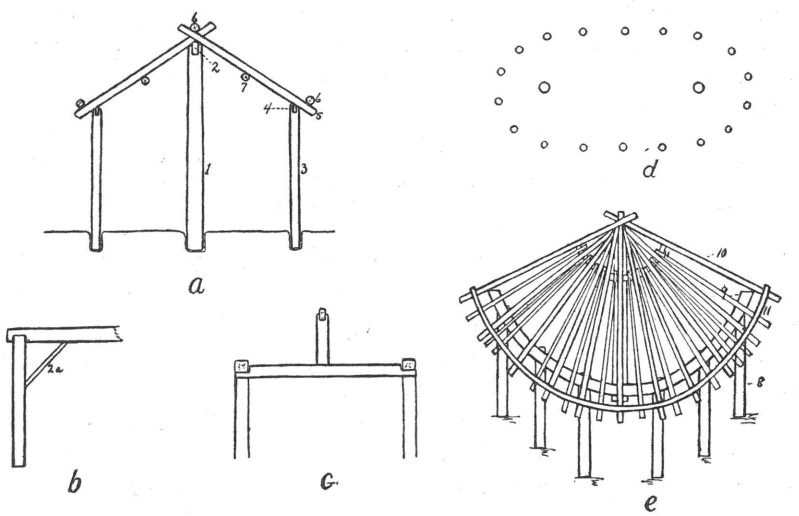


Figure 1.—Details of house frames in Tahiti: *a,* framework of the *fare hau pape:* 1, end post; 2, ridgepole; 3, side post; 4, plate; 5, rafter; 6, upper ridgepole and eaves batten; 7, purlin; *b,* joining of ridgepole and end post with oblique brace (*a,* 2); *c,* king-post supported by beam; *d-e,* ground plan and frame of *fare potee;* 8, end post; 9, curb plate; 10, rafter; 11, curved purlin.

First are dug the two post holes (fig. 1, *a*), from 2 to 3 feet deep, intended to receive the two end posts upon which the ridgepole rests.

The two end posts (fig. 1, *a,* 1) are set up in their respective holes, and are made firm by tamping down stones and earth around them. Ellis (10, vol. 1, p. 171) speaks of the end posts of the house he is describing as being square, but these supports also are commonly round.

A variant mode of construction consists in the use of tiebeams (*pae*) that rest upon the corner posts. Emory questions the use of *pae* in this connection, as he found *tea* meaning "tie beams" in the Leeward Islands. According to Davies (8), *pae* signified block, stone, or anything to fix or support the joists under a floor, sill, threshold, etc. Upon these *pae,* instead of in the ground, rest the king-posts that support the ridgepole (fig. 1, *c*).

The ridgepole (fig. 1, *a,* 2) is lifted into place by hand or hoisted by means of ropes. Ridgepoles are today commonly rectangular in cross section, occasionally round. Ellis (10, vol. 1, p. 171) describes the one used in his Moorea house as "nearly triangular, flat underneath, but raised along the center on the upper side, and about nine inches wide; the joints were accurately fitted, and square mortises were made, to receive tenons formed on the top of the posts." Other forms of mortising and fitting observed are shown in figure 2.

Usually small oblique braces (fig. 1, *b*; 2, *a*), like that shown joining a post or a plate, pass from the ridgepole to the end posts at an angle of about 45 degrees and are added for the sake of stability.

Next are dug the post holes (fig. 1, *a*) for the small side posts which vary in number according to the size of the house, and the side posts (fig. 1, *a,* 3) are set up. According to Ellis these were placed from three to four feet apart. They are usually farther apart than this in the modern *fare hau pape,* and in the large *fare putuputuraa* they are at even wider intervals. The side posts are generally square now; but it seems likely that round posts would frequently have been found in the old open native houses as they are in Samoa. In small *fare hau pape,* round posts that preserve their natural uncut form are common.

On top of the side posts are placed the plates (fig. 1, *a,* 4), which run the length of the frame to support the roof rafters at the lower end. The plate is rectangular in cross section, rarely round, and is fitted to the upper end of the supporting posts.

The rafters (fig. 1, *a,* 5) are next laid from 3 to 4 feet apart upon the ridge and the plates and lashed in place. These meet and cross each other above the ridge, extending a few inches beyond the point of intersection. Each rafter is notched on the under side to fit the edge of the plate. At their lower ends they extend considerably beyond the plate to receive the thatch

that forms the eave. In some of the large assembly houses an extra stick is lashed to the end of the *aho* to give the required extension for the deep eave (Pl. V, *B*). The size of the rafters, of course, depends upon the size of the house. The largest are about 6 inches in diameter, while the smallest are mere sticks of *purau* or bamboo. The lower extremities of the rafters are, in the large houses, tapered off on the under side for the sake of neatness.

An upper ridgepole, termed *totoroiore, toroiore,* or (on Maupiti), *kokoiore,* is laid along the fork formed by the crossing of the upper end of the rafters, running above and parallel with the ridgepole, to which it is lashed at intervals (fig. 1, *a,* 6). The function of this rod is to hold the ridge thatching which is lashed or pinned to it.

Along the upper side of the rafters where they extend beyond the plate, from 6 to 18 inches above the lower ends, are lashed eave battens or purlins (*toroiore*); and purlins are lashed beneath the rafters midway between the plate and the ridge (fig. 1, *a,* 7).

Whether there existed in these islands an arched or vaulted form of roof is a most interesting question but one that must be left open until more conclusive evidence is found. Emory points out that two drawings of Parkinson (21, Pls. VI and XII) show a squared-end chief's house with an arched roof. Emory remarks that Parkinson's drawings are demonstrably so inaccurate that this would not be weighty evidence were it not that the Spaniard, Boenechea (7, vol. 1, p. 337) seems to clearly refer to such a roof in writing:

"There are some very capacious houses among the rest, with their roofs framed in the form of an arch or vault, reminding one of the tilt of a Murcian waggon. Several of the *ariis* reside in such."

Parkinson (21, p. 74) refers to an arched roof in describing canoe houses he saw on Raiatea: "There is a great number of boat-houses all round the bays built with a Catanarian arch, thatched all over . . ."

Such evidence, from two independent sources, cannot be disregarded; and yet, if Parkinson actually saw this style of roof, I cannot but feel certain that it would also have been remarked by Cook, Banks, the Forsters, or Wilson; all of whom were careful observers, which Parkinson certainly was not.

Fare Potee

The form that was typical of coastal Tahiti, Moorea, and the Leeward Islands in pre-European times was the *fare potee.* Figure 1, *d* shows the ground plan of a small house of this type. The frame consists of a central section known as the *tino fare* (body of the house), the frame of which is built like that of the *fare hau pape,* to which is added, at either end, a round section, giving to the whole an oblong form. The name of this style of house is derived from the term that refers to the round end (*potee*). The

old style *fare potee* is not at all used in Tahiti today. In constructing the *fare potee* the body of the house is completed as described above and the ends are added. The numbers that follow the names of the several parts of the *potee* refer to figure 1, *d, e.*

The first step in making the *potee* was to dig the holes to receive the semicircle of end posts (fig. 1, *e,* 8) that correspond to the side posts. The end posts are set firmly in the ground. Each of these posts was cut at its upper end, to receive and hold the curved end plates, or curb plates.

This curb plate (fig. 1, *e,* 9) was made of a log of *purau* wood which had been soaked, warped, and dried into the required arc. The plate was then lashed firmly on the semicircle of posts. The ends of the curved end plates and those of the straight side plates overlapped where they met, being cut to make a snug juncture.

The roof rafters (fig. 1, *e,* 10) of the *potee* were next put in place. These radiate like the ribs of a fan, from the end of the ridgepole. Where they passed over the plate they were notched as were the rafters of the side roof.

The rafters were next bound together at their lower extremities and between the plates and the ridgepole by means of curved purlins (fig. 1, *e,* 11). The frame of the *potee* was then complete and ready to receive its thatch.

The large *fare potee,* examples of which are still to be seen in the Leeward Islands, are built according to the plan just described, except that there are certain additional requirements that have to be met in the larger structures. Some of the *fare potee* standing in 1923 were very large, and in early times they were even larger. The old form of large *potee* in Tahiti had running down the middle of the floor a number of great central posts that supported the ridgepole. Tyerman and Bennet (26, vol. 1, p. 113) describe a large house with nine posts supporting the ridgepole. There are no *fare potee* with this feature now to be seen. All of the modern houses of this type present marked variation: they have long massive tiebeams resting upon side posts, from which rise the short posts that support the ridge and take the place of the high central pillars. (See Pls. IV, V.) This is a trait of construction typical of the Raiatean form of dwelling. I am, therefore, inclined to believe that it represents the ancient Leeward Island method of constructing the large assembly houses in contrast to the Tahitian use of central posts rising from the floor.

The best means of giving a clear and definite picture of the form and construction of the large *fare potee* will be to describe part by part one of these large houses studied and photographed, adding to the description details concerning other houses studied in 1923. (It is probable that this house, which was on the island of Maupiti, was wrecked by the hurricane of 1926.)

The earth floor of the Maupiti *fare hau* was raised about 2 feet above the level of the surrounding ground and encased in a low wall made for the

most part of roughly cut coral blocks, with which were combined chunks of stone from the seashore. This method of elevating the floor is typical of Tahiti, but not of the Leeward Islands, other than Maupiti, where it seems to be the rule to elevate the floor on posts. The floor of the Maupiti house was covered with sand, while those of the other Leeward Islands assembly houses were made of boards resting on the elevated substructure. This Emory believes to be a missionary innovation.

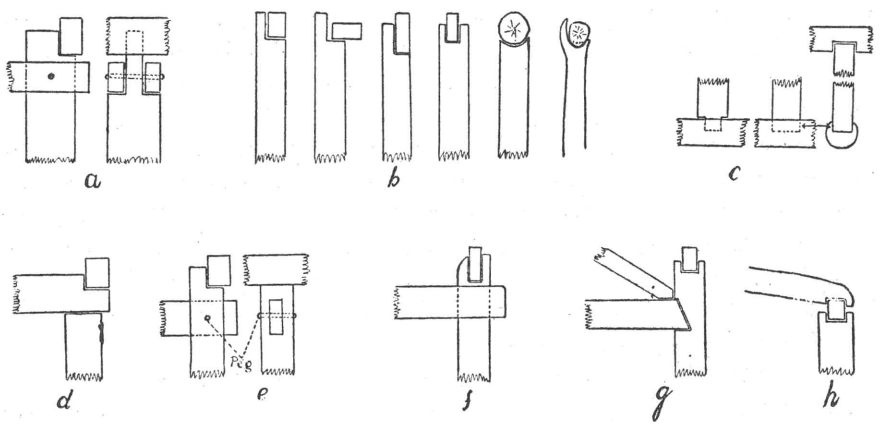


FIGURE 2.—Fitting of timbers in house frame: *a,* junction of tiebeam and plate on side post and of rafters on plate, Maupiti *fare potee; b,* methods of fitting plate to side post and ridgepoles to supporting posts; *c,* common methods of mortising uprights in crossbeams and ridgepoles; *d,* tiebeam, plate, and side post, assembly house, Opoa, Raiatea; *e,* crossbeam, plate and side post, Maupiti dwelling; *f,* tiebeam, side post and plate at Anau, Borabora; *g,* tiebeam, side post, plate, and oblique brace, Vaitape, Borabora; *h,* tiebeam, plate, and side posts of *fare taupee,* Raiatea.

Along either straight side of the Maupiti house there were 11 wall posts (*pou*) made of breadfruit wood standing about 5 feet apart, while at either end there was a semicircle of 9 posts (*pou*) of the same material and size.

Six long crossbeams (*te'a*) made of breadfruit wood that support the posts on which rests the ridgepole were fitted to alternate pairs of side posts just below the top, the side posts being cut away on each side as shown in figure 2, *g,* and the end of the tiebeam mortised to fit, *faafaura,* on this tenon, termed *aura* (fig. 2, *g*) (Pl. IV, *A*). The tops of the side and end posts are cut to receive the plate (*rape*) of breadfruit wood, as shown in figure 2, *g.* Variations in the method of fitting the plate and the tiebeams to the side and end posts in other houses are illustrated in figure 2 *d, e, f, g, h.*

At their mid-points the crossbeams support heavy king-posts (*pou tahuhu*) hewn out of breadfruit wood. Tenons at their lower extremities

fix these in the crossbeams. In the *fare putuputuraa* at Vaitape, Borabora (Pl. V, *A*), oblique struts are seen to run from the base of these posts to the ridgepole, and this was true also of the *himene* house at Tevaitoa, Raiatea; but there were no such struts in the *fare hau* at Maupiti.

In this same *fare putuputuraa* at Vaitape, as well as the one at Anau, Borabora, oblique struts also run from the base of the king-posts to principal rafters which extend from the tops of the king-posts to the outer ends of the tiebeams.

Upon the upper ends of the *pou tahuhu* rests the great ridgepole (*tahuhu*), a hewn beam of breadfruit wood, flattish in cross section.

The rafters (*aho*) from ridge to plate along the straight section of the roof are made of *Pandanus* trunks. Though flimsy and perishable, this wood is the best obtainable, in sufficient quantities for this purpose, in Maupiti, where it grows in great abundance on the *mutu* (coral fringe) that surrounds the lagoon. Elsewhere the side rafters are made of coconut or breadfruit wood.

The curved end roofs of the Maupiti *fare hau* have rafters made of coconut and *ahia* wood, which must be stronger than those along the sides, because they cannot be braced as effectively.

The usual purlin (*faaetaeta*) is lashed along the under side of the rafters about 5 feet below the ridge pole. The purlin along the straight side of the roof is of coconut wood; those in the curved ends, where they are warped into a contracted bow made up of several pieces (Pl. IV, *B*) are of *purau*. It will be observed in Plate IV, *B*, that below this brace in the curved ends, one or two extra rafters are inserted between each pair of the long rafters radiating from the end of the ridgepole to the curved end plate. In a *fare putuputuraa* at Anau, Borabora, an oblique strut runs from the tiebeam at the end of the house to the middle of the principal end rafter as an extra support for the weight of the end roof.

Returning again to the straight section of the roof, it will be seen in Plates IV, *A*, and V, *A*, that the weight of the long thatched roof is not borne entirely by the *Pandanus* wood rafters. From the top of each of the posts that support the ridge to the top of the side post below runs a principal rafter *rau etaeta*. The purlins (*faaetaeta*), to which the *Pandanus* rafters are lashed, rest on these principal rafters, which are in turn supported at this point upon a strut (*etaeta*) that rises from the tiebeam (Pl. IV, *A*). These braces serve both to support the weight of the roof and to give stability to the whole structure. They are made of coconut wood.

The roof is thatched with the mats of *Pandanus* leaf (*rau oro*). The preparation and putting on of the thatch is described on pages 25-27. I was told that about 80 *tihope* [one *tihope* equals 200] *rau oro* were used in thatching this house, but this seems excessive. Half that number would

probably be nearer the mark, but the number required would be very great.

The eaves of this house presented an interesting feature of construction. The rafters, neatly tapered off, ended about 3 feet out from the plate, where the regular thatch ended. At this point there is lashed along the rafters, resting on their upper sides, the usual eave batten (*torotoro iore*). The eave was then extended in the following way. To the projecting end of every fourth rafter was lashed an extra piece making an extension of about 3 feet. These pieces supported a second *tortoro iore;* and on this and the other above it were laid and lashed ornamental *Pandanus paua* (mat screens). The pendant ends of the *Pandanus* leaves forming these mats were neatly trimmed below the margin of the eaves (Pl. III, *A*). The ridge is thatched with *aretu* grass, with coconut leaf mats on top. The thatching of the ridge is described on pages 28-29.

The spaces between the side posts, with the exception of several openings made for entrance and exit are closed by means of *purau* poles set upright and held in place by being lashed to horizontal rods (*patini*) which run around the outside as shown in Plates IV, *A;* V, *B*. The making of such walls is described on pages 29-31. The walls of the *himene* house at Tevaitoa were made of woven bamboo; that shown in Plate V, *B,* is made of bamboo rods set upright. In the assembly at Anau, Borabora, the sides are left open in the ancient style.

At Maeva, Huahine, the *fare putuputuraa* measured by Emory was found to be 92 feet in length, 30 feet in breadth; while those at Anau and at Vaitape, Borabora, were both 120 feet in length. Some dimensions of large ancient *fare putuputuraa,* as given by early visitors, are as follows. Banks (1, p. 134) described one that measured 162 feet in length by 28.5 feet in breadth. The height of "one of the middle row of pillars (was) 18 feet." This writer remarks that some of the assembly houses were much larger than this. Cook (4, vol. 1, pp. 96-7) speaks of houses being 200 feet or more long, 30 feet broad, and 20 feet high. The Spaniard, Maximo, mentions (7, vol. 3, p. 171) that the house of the chief at Faaa—undoubtedly a *fare potee*—was 83 paces (249 feet) in length. Captain Wallis (29, vol. 1, p. 462) gives the measurements of the great guest house at Matavai as 327 feet in length, 42 feet in breadth and records 14 central supporting posts, 30 feet high, and 39 side posts, 12 feet high. The largest house of which I have record is one 397 feet long, described by Ellis (10, vol. 1, p. 175) as being located on the borders of the district of Pare.

Fare Taupee

The form of building typical of the Leeward Islands is the *fare taupee.* The term *taupee* refers to the sloping end sections of the roof which characterize this form of house.

Since the building of the *paepae raau* (floor platform) is now always a part of the erection of a *fare taupee,* it will be best to describe the construction of such a platform in connection with the building of the house, though this platform and the house frame are actually entirely distinct units which may be dissociated.

In the following description, the numbers in parentheses correspond to those in figure 3, *a, b.*

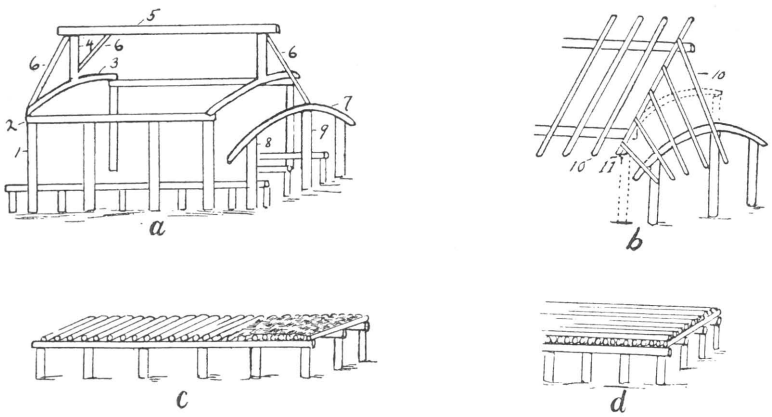


FIGURE 3.—Details of Leeward Islands house frame: *a,* frame of *fare taupee:* 1, side post; 2, plate; 3, tiebeam; 4, king-post; 5, ridgepole; 6, oblique brace; 7, arched end plate; 8, corner post; 9, middle end post; *b,* end of *fare taupee* frame: 10, rafters; 11, end rafters; *c,* platform on piles; *d,* platform with double flooring.

The erection of the body of the house, including the side posts (*pou poto*) (fig. 3, *a,* 1), the plates (*rape*), (fig. 3, *a,* 2), crossbeams (*te'a*) (fig. 3, *a,* 3), posts supporting the ridge (*pou tahuhu*) (fig. 3, *a,* 4) and the ridgepole (*tahuhu*) (fig. 3, *a,* 5), and the application of oblique braces (*piriti*) (fig. 3, *a,* 6), follows the same order and method of construction as that already described on pages 10-11, in the Tahitian *fare hau pape,* except for two important details: the arched form of the tiebeam, a distinctive feature of the arch-ended *fare taupee*; and the greater length of the side posts, which is required to allow for the elevation of the floor.

To make the end sections (*taupee*) two low corner posts (*pou poto*) (fig. 3, *a,* 8), several feet shorter than the other side posts, are set up in line with the central frame, and then a middle end post (*pou poto*) (fig. 3, *a,* 9) of approximately the same height as the side posts of the frame is set up. Instead of a single high end post there may be several as in the Maupiti house described on pages 13-16. Upon the end post is laid an arched end plate *rape taupee* which resembles the crossbeams that hold up the ridge

except in the matter of length, for the plate extends several feet beyond the line of the side posts for the sake of the broad eave which is typical of this style of house.

The end rafters (*aho*) (fig. 3, *b*, 10), both in the body of the house and at the ends, are all round poles of *purau* (bamboo) except that in some houses those at the ends of the straight sections of the roof (fig. 3, *b*, 11) frequently, though not always, are flattish and cut rectangular in cross section, and should be made of some strong wood, such as coconut or breadfruit, because they support the upper ends of the rafters of the *taupee*.

The eave battens (*torotoro iore*), running along the lower ends of the rafters at the sides and ends, and the upper ridgepole called by the same name that rests upon the fork of the rafters where the pairs cross, are put on in the *fare taupee* exactly as in the *fare hau pape* and *fare potee*. The purlin (*faaetaeta*) which is lashed to the under side of the rafters between the ridge and the plate is sometimes used but is frequently omitted.

After the frame of the house is complete except for the rafters, the platform for the floor (fig. 3, *c*, *d*) is built. The elevation of floors ranges from one to 3 feet. The supports (*aturu*) consist of three or more rows of uprights or supports that run with the length of the house, consisting generally of sections of coconut logs having their lower ends sunk in the ground. The logs forming each row are placed 5 or 6 feet apart from each other, while the rows range from 8 to 10 feet apart, depending upon the width of the house (Pls. VI, X). Sills (*pa'e*) consist of small logs laid upon each row of supports, which are forked or grooved to receive them (fig. 3, *a*, *c*). Beams (*ra'o*) are next laid across the sills and bound to them as a flooring (fig. 3, *c*, *d*). In large houses with extensive floor area, an additional set of beams (fig. 3, *d*) is placed closer together than the first set and at right angles to them. The floor is not actually laid until the thatching of the roof is done; but the description of the flooring may be included here for the sake of completeness. This set (fig. 3, *d*) consists of small, peeled *purau* poles or bamboos (*fafau*), replaced in modern times by the planed boards that serve for flooring. On the floors (*ra'o*) made of *purau* or bamboo is commonly put the woven split bamboo (*raraa*) which makes an excellent, smooth, durable, and clean flooring (14; Pl. IX, *A*).

The *fare taupee* is now ready to be thatched and to have its sides closed. A beautiful example of this type of *fare taupee* was examined and photographed in Maupiti in 1923. (See Pls. VII, VIII.)

This dwelling combines in an interesting way the two types of foundation, the stone, and the wooden platforms. Although the house is elevated on a *paepae* made of several terraces faced with stone, its floor is laid on a wooden platform of the type that is characteristic of Raiatea and Borabora.

The impression given by Plate VII, *A* and *B*, is that the floor rests on the ground, which, however, it does not, as will be seen by observing the bottom of the door. The extension of the walls to the ground for the sake of a neat appearance, and the log sill enclosing the ground area, which give the impression that the floor is on the ground, are not at all typical of the *fare taupee* of today—in fact, this was the only instance observed. The general rule is for the walls to end at the floor, leaving the space beneath open so that the house posts and the floor supports are exposed. The usual appearance of such houses is shown in Plates VI, *A*, IX, *A*. Emory, however, has observed walls coming to the ground on one side of the house in several dwellings at Anau, Borabora.

The side posts of the *fare* are made of breadfruit wood, hewn square. In the other houses studied, the posts were left in their natural round form.

The ends of the tiebeams, which are of coconut wood, rest upon the tops of the posts at the corner of the body of the house. The tops of the posts are mortised into the ends of the tiebeams, which, in this house, are scarcely arched at all. In a house of this type studied on Raiatea, the beam has more of an arched form.

The king-posts are made of breadfruit wood, which is more satisfactory than the fibrous coconut wood for shaping into tenons and mortises. The supports are mortised into the tiebeam as shown in figure 2, *c*. The ridgepole is also cut out of a breadfruit tree trunk and fitted upon the tops of the king-posts (Pl. VIII, *A*). The side plates, made of coconut wood cut square, are fitted upon the side posts and to the ends of the tiebeams upon which they rest at the corners (Pl. VIII, *B*).

The five end posts in this broad house are made of breadfruit wood. In the little roughly-made frame (Pl. VI, *B*) it will be observed that at both sides and ends, posts were chosen, having a natural crotch that made a socket to receive the poles that served as plates.

The arched end plates in the Maupiti house are made of coconut wood cut square, warped into the proper shape, and fitted in square notches cut in the tops of the end posts (Pl. VIII, *B*).

Following the order of construction, the platform of the floor demands attention next. The wood platform of the Maupiti house, including posts and beams, is made of coconut wood throughout, except for the pine boards of the floor and some crosspieces 2 by 4 inches under these made of the same trade lumber. The floor platform in this house is a distinct structural unit in itself, built within the house frame, and is true to the Raiatean type.

For the frame of the house, the rafters used in the Maupiti *fare* are all of ironwood, as are also the purlins along the lower ends of the rafters, and the upper ridgepole to which the thatching on the ridge is bound to the

main ridgepole at intervals of 4 feet, by means of lashings of sennit passing round the pole and through holes in the top of the ridgepole. The side and end roofs are thatched with *rau oro,* or *Pandanus* leaf thatch mats. Where the ends hang low over the eaves they are neatly trimmed.

Leaf thatch of *Pandanus,* which is rarely seen in Tahiti, is still extensively used in the Leeward Islands; but many of the hastily built *fare taupee* of the region are thatched with the more easily-made, but less durable, coconut leaf mats. The ridge is thatched, as usual, with *aretu* grass.

The walls consist of latticework of small bamboo rods bound together as described on pages 29-31. The rods rest on a sill made of hewn coconut wood timbers laid upon the ground around the base of the structure, and they come almost to the height of the plates at sides and ends. The use of bamboo for walls of this type is general; sometimes rods of *purau* are substituted, but these are less used in the Leeward Islands than in Tahiti. On the other hand, the woven split bamboo (*raraa*) is much more common in the Leeward Islands than it is in Tahiti.

This well-made Maupitian dwelling, which contrasts strongly with most of the modern buildings of the same type, in the use of durable materials and in skill and neatness of work, stands as an exemplification of the more careful and thorough work that was the rule rather than the exception in the days before pride in good native craftsmanship had been replaced by the carelessness and neglect that pervades every phase of modern native life.

One feature typical of the Leeward Islands *fare taupee* is not represented in the Maupiti dwelling just described. This is the deep little porch (*taumaru*) nestling under the low eaves in front (Pl. IX, *A, B*), also, though rarely, at the back. The porch is made by setting the wall and wall posts of the house back from the edge of the floor, or by extending the roof and the floor. The latter method is that generally employed, as the houses with porches are much wider in proportion to their length than the porchless houses. To support the roof over the porch, an extra set of posts and an extra, lower, wall plate are required.

A house at Hotopuu, Raiatea, which gave us shelter overnight during a canoe voyage round the island, represents a most interesting variation from the usual Raiatean form. So far as the frame and roof are concerned, the house is true to the usual Raiatean type. But the distinctive feature of the house is the fact that only one end of the building has a floor, which is elevated as usual, and sheltered with coconut leaf *paua* on two sides; the other half of the house is open. This open section served for cooking and food storage, taking the place of the cookhouse, which is usually a separate shed. Several houses of this type were seen by Emory at Anau, Borabora (Pl. X, *A*), but they were enclosed at both ends.

Modern Taupée

A type of *fare taupee* having a flat, sloping end roof is now widely used. The form of roof used in this type is probably copied from French buildings in which the flat sloping ends are common. Natives say that this is not an ancient form; and this information is borne out by other evidence. Such roofs are not mentioned by early visitors to the Society Islands. Furthermore, I have recently come upon interesting evidence that on Huahine, where this style now prevails, its introduction has been fairly recent. All the houses observed at Maeva were of this type (Pl. XI, *A*), which I at first believed to be a distinctive form of Huahine. Later, however, I found in Papeete an old postcard, not dated but evidently made many years ago, depicting the same village with every house showing roof ends of the typical Raiatean style, with low arched *taupee*. Between the taking of the picture, shown on the postcard, and the time of my visit, it is evident that the straight (flat) *taupee* style had been adopted in Maeva, replacing the old arched form. A similar use of the flat *taupee* was observed on numerous dwellings in Huahine, Tahaa, and Raiatea. In only one dwelling in Tahiti was it seen; but here, and on Moorea, it appears occasionally on kitchens.

So far as the main structural features of the roof frame are concerned this form of *fare taupee* is built on the same principle as that already described, that is, in the support of the ridge on king-posts rising from tie-beams resting on the side plates and side posts. The side posts are usually higher than those of the old style *taupee*. The plates are approximately twice as long as the ridgepole, so that they extend at either end, about half as far again as the ridgepole. The side and end posts are of the same

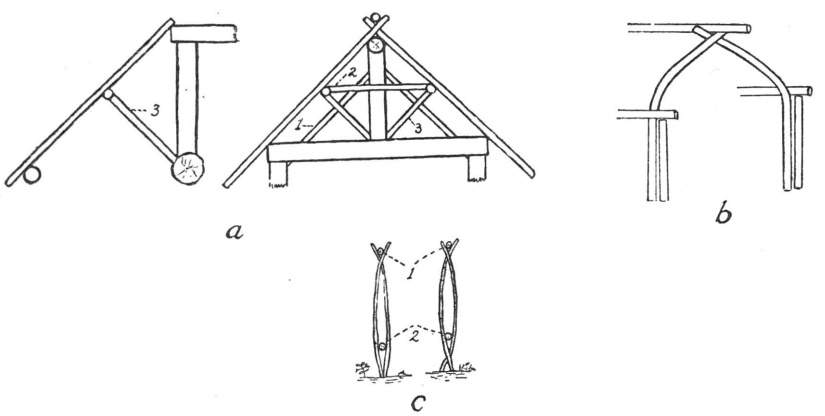


Figure 4.—Details of construction of roofs and fences: *a*, arrangement of braces at side and end in house of Tumaraa, Raiatea: 1, oblique strut; 2, collar beam; 3, oblique strut to purlin; *b*, manner of supporting ridgepole of boathouse; *c*, fence of tamanu rods 33 inches high at Maupiti: 1, upper rails in cross section; 2, lower rail.

height throughout; and the end plates are straight and of the same height as those at the side. The flat *taupee* is produced by running oblique poles from the ends of the ridgepole to each corner of the frame, making a triangular end roof frame upon which are laid the end rafters that receive the thatch (Pl. XI, *B*). The roofing is put on as in other types of houses.

A *fare taupee* of the flat-ended type observed at Tumaraa, Raiatea, had an elaborate system of braces. These were perhaps necessitated by the fact that the house stood on top of a high exposed knoll (fig. 4, *a*).

Round Houses

According to Te-rai-tua, there used to be built on Maupiti a round house with a single post in the center, termed the *fare pou taa,* or *fare pou tahi* (single post house). Rafters ran from the central post to low side posts; or else, in some *fare pou tahi,* there were no side posts, rafters coming right down to the ground. These were sometimes thatched with *Pandanus* mats; but frequently they were thatched all over with *aretu* grass. The grass was lashed in bunches on longitudinal ribs of wood on top of the rafters.

Emory feels that this verbal description derived from a single informant should not be accepted without confirmation. He points out that such a "wigwam-shaped house," as is described, is foreign to Polynesia, and writes:

> I have seen at Maeva village [Huahine] a *fare taupee* [rectangular] with the ridgepole supported by a single king-post, which was supported in turn by a tiebeam. The king-post was mortised into the center of the ridgepole. May not the *fare pou taa* or *tahi* [described by Te-rai-tua] have had a ridgepole?

Reference to my Maupiti notebook shows that Te-rai-tua specifically stated that there was no ridgepole, and the house was round.

Emory remarks further that for a round house, with rafters resting on the ground and meeting in the center, a center post "is superfluous." The center post is perhaps not essential, but it would certainly increase strength —and on Maupiti, which was recently swept by a hurricane, this is by no means a negligible consideration. The form of house described by Te-rai-tua, with rafters joining the ground, would be ideally suited to withstanding high winds, such as frequently lash this exposed islet.

I feel that the questions raised by Emory ought to be recorded along with my informant's description, for this form of house constitutes one of several exceptional cultural traits which Te-rai-tua described to me as belonging to old Maupiti. Another of these unusual traits, namely, the use of the shield, is, like the "wigwam-shaped house," as Emory terms it, not only exceptional in the Society Islands, but in Polynesia as a whole. Were there some traits preserved in Maupiti derived from non-Polynesian castaways? Te-rai-tua might be suspected of having seen, when a boy, a shield that had come to

Maupiti from Melanesia or Malaysia on some foreign ship—but the house form could not have been impressed on his mind in this way.

In spite of the objections raised by Emory, I retain my confidence in Te-rai-tua as an accurate informant, and consequently accept his word that there existed in Maupiti a round house with a post in the center and no ridgepole. Nevertheless, I agree with Emory, that the question of the existence of this form is too important to be accepted as proven on the authority of a single verbal description.

Cookhouses

Cooking in the Society Islands is almost always done in a small separate house containing the fireplace, utensils, and provisions. The cookhouses (*fare tutu*) may be mere sheds or shelters of coconut thatch on a frame

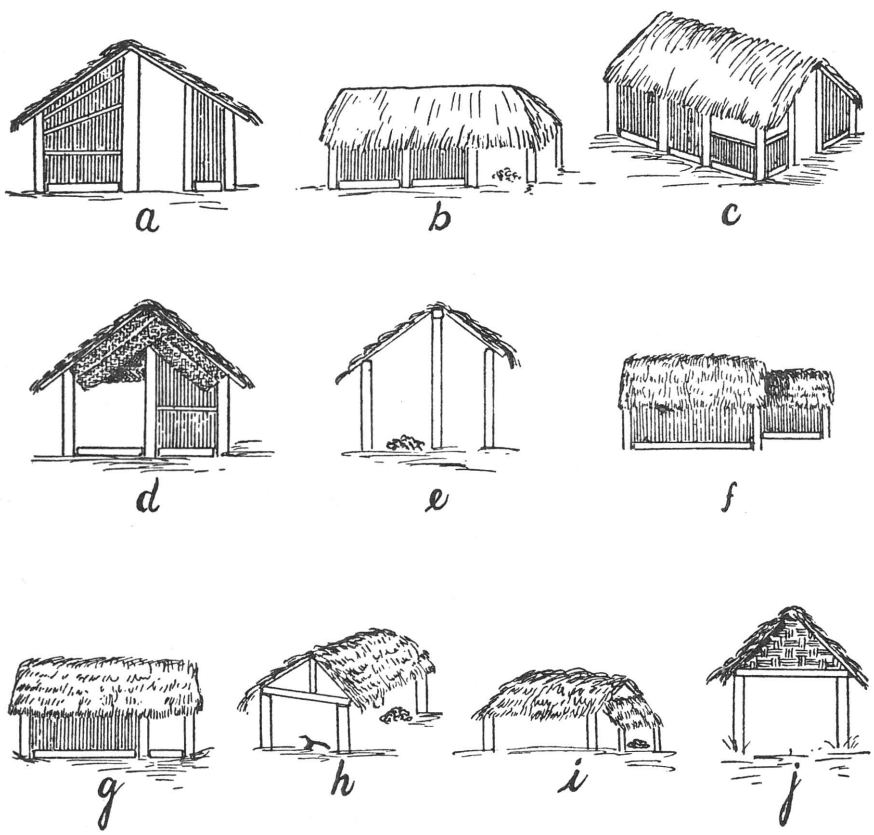


Figure 5.—Types of cookhouses: *a*, at Raiatea and Tahiti; *b*, *c*, at Moorea; *d*, common form; *e*, at Papara, Tahiti; *f*, at Vairao, Tahiti (preparation room at left, oven room at right); *g*, at Afaahiti, Tahiti; *h*, *i*, *j*, shed types.

of poles; but frequently they are well-built houses, usually small but sometimes as large as the smaller dwellings. There is a great variety of form. Figure 5 shows sketches of typical cookhouses. The simpler sheds are open at the sides, and in such *fare tutu* there is no groundwork. When the house is walled, squared timbers are laid on the ground to form a sill. Kitchens are almost always built with simple gabled frames of the *fare hau pape* type (fig. 5, *a, h, j,*) either with the full-length end posts supporting the ridgepole or with the tiebeam resting on the side posts. Occasionally a flat or arched *taupee* is added to one end (fig. 5, *b, i*). Often the sides are open entirely except in the gable where there is put *niau, paua,* or *raraa* (fig. 5, *j*). The sides and front, when walled, are usually closed by rods of *purau,* or bamboo. These sometimes come only half-way up (fig. 5, *c*), when there is a wooden rail that runs along the tops of the rods. The walled-in kitchens have a doorway in one or both ends (figure 5, *a, c*). Two *fare tutu* were seen on Maupiti built exactly like the boathouses described below, but, of course, much smaller. The thatching is usually *niau,* but occasionally *rau oro* is used. Inside, the kitchen will have, at one end or one side, the shallow hole filled with small stones that serves as the *himaa* (oven). There is no outlet for smoke except the openings at the sides. Such utensils as are used will be kept in the kitchen, which serves not only for cooking but is the family eating place. Food supplies are also kept here: bunches of bananas, breadfruit, taro, yams, sweet potatoes, fish, or pork; whatever the family larder happens to contain at the time. In addition there are bottles of sea water for seasoning, cans of fresh water, the gourd (*hue*) in which grated coconut meat is fermented, the coconut grater (*ana*), food trough (*umete*) in which foods are prepared and mixed, perhaps a small stool (*parahiraa*) and small stone pounder (*penu*) if there is a healer in the family, baskets, carrying poles, and so on. Sand is sometimes put on the floor, but floors are usually nothing but bare dirt on which accumulates all sorts of refuse. The cookhouse is naturally a favorite resort of pigs and chickens. In it are also frequently kept fishing tackle, such as rods, hand nets, and tools.

Boathouses

The canoe hangar (*farau vaa, farau pahi,* now *fare poti*) consists of a long gabled shed, built by the shore, having side posts, plates, ridgepole, rafters, and thatching corresponding to, and called by the same terms as those in the dwelling. But there is one distinctive and interesting feature characteristic of canoe or boathouses, and that is the manner of supporting the ridge. This is accomplished by means of *turu,* or *o'a* which are single pieces of wood rising on either side and bending inward at the plate with the angle of the gable, and running up to the ridge, where they cross each other

(fig. 4, *b*). Here they are securely lashed together. The ridgepole rests on these where they cross. A small tree trunk having a stout branch at the proper angle is usually chosen and trimmed to make a *turu*; but a straight pole may be warped to the right shape. The use of the *turu* obviates the necessity of using either central posts or tiebeams to support the ridge, thus leaving the whole interior of the house unobstructed to receive a boat. The use of the tiebeam resting on the side posts would leave the interior unobstructed; but this would require a higher roof than is necessary when the *turu* are used, and the high roof would give less shelter to the boat and would not stand the winds on the shore as well. The *turu* stand at either end of the boathouse and at intervals to keep the ridgepole from sagging. The same method of supporting the ridgepole is sometimes used in large storage sheds.

Under the ridge of boat sheds there are at intervals crosspieces (*te'a aho*), upon which are placed oars, masts, and other equipment. The ends of such houses are closed sometimes with screens of the kind that can be raised (*paruru*), or one end may be screened with stationary *paua*. The sides are usually open.

Ellis (10, vol. 1, p. 176) refers to the *turu* as *oa*, and this term for them was heard on Maupiti. Evidently some of these houses were of considerable size in the old days, for Bougainville (2, pp. 274-5) used one, from which a chief's canoe had been removed, for a hospital, raising under its roof tents to receive 34 sick members of his crew. The shed is said to have been "well made, and entirely covered with a kind of mats"—probably (*ni'au*).

THATCHING

Pandanus leaves (*rau oro* or *rau fara*) make the most durable thatching material. The mats of *rau oro* that are lashed on the rafters are made by men, never by women, in the following way:

Quantities of *Pandanus* leaves are gathered and hung up to dry (Pl. XII, *A*). They are then put to soak in salt water for several hours or several days. The spiny borders of the leaves are stripped off. Next the leaves are flattened out by a process termed *pue'e*. A heavy stake is driven in the ground, leaning at a slight angle away from the worker. A small log is placed close to the stake (Pl. XII, *B*), and upon it is laid a strip of *purau* bark. A pile of *Pandanus* leaves is at the worker's left. Picking up a leaf, he draws it round the stake along its full length, first on one side, then on the other, then passes the looped leaf down to the ground so that it lies over the log and the strip of *purau* bark. He draws the small end of the leaf over a corner of its butt and places his foot on the small end to hold it while he prepares another leaf in the same way. This leaf is laid down around the preceding one in just the same way. When a sufficiently large number of the overlapping loops lie on the log, held in shape by his foot, the

man draws over and ties the ends of the strip of *purau* bark, binding the bundle where the ends of the looped leaves overlap. The bundle is then lifted off the stake and put to one side, and the making of a second bundle is started, and so on until sufficient leaves are ready to be made into the thatch mats.

To make one of the mats, a stem of papyrus (*aeho*) about 5 feet long is taken to serve as the base. Beginning at the left a leaf of *Pandanus* is bent (*ofati*) over the stem about 14 inches from the butt of the leaf. A second leaf is then laid on, overlapping the first about 1 inch. At a point about 3 inches below the *aeho* the *rau oro* is then pierced (*tui*) with a large needle (*tui rau oro*) made of the front leg bone of a pig (fig. 6, *b*). Where the

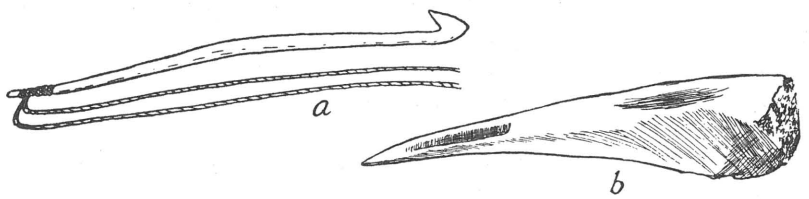


FIGURE 6.—Thatching implements: *a*, thatching needle (*hauato*) of ironwood from Huahine, about 8 inches long (the cord is for attachment to the right arm); *b*, bone instrument for puncturing *Pandanus* leaves in making thatch mats, Maupiti.

margins of the leaves overlap the point of the needle is thrust down through the leaves underneath for about 0.5 inch, and then up through the overlapping margins again. Then the needle is turned sidewise in the hole so that its breadth opens out the splits in the leaves. The end of a long bamboo strip (*ofe*), which is to form the binder of the thatch mat is then thrust through the holes and the needle is withdrawn. So successive leaves of *Pandanus* are bent over the *aeho,* the overlapping margins are pierced, and the bamboo rod thrust through, until the *aeho* has been covered for its whole length. Single *Pandanus* thatch mats are, in counting, for example, referred to as *aeho* or *rau oro* (*e hoe aeho* or *a hoe rau oro,* one thatch mat). The average length of these elements was found by measurement on Maupiti to be 59 inches. A completed mat ready to be lashed onto the rafters is shown in Plate XII, *C*.

The thatch mats are put on the rafters by men standing inside or underneath the roof. A scaffolding on which the men stand for this work is built up as shown in Plate XI, *B*. A beam that runs the length of the roof is placed on the tiebeams down the middle of the house. On this rest the upper ends of oblique poles or these are tied to the side posts, and on the oblique poles are lashed long horizontal poles about four feet apart, one above another. On these the thatchers stand as they work. The thatch is laid on in successive rows (*hono*) running from eave to ridge. The first thatch mat

is laid upon the eaves batten. In several houses at Maupiti the first mats at the eaves were not simple *rau oro* but the broader *paua* made of *Pandanus* leaves, described on pages 30-31. The trimming of the thatch at the eaves for the sake of neatness has already been mentioned. This is not done until after the building has been finished. Having put on the first mat at the eave, successive mats are laid on and lashed, the upper margin of each being placed from 2 to 2.5 inches above that of the mat next below. When one *hono* is finished, the process is repeated from eave to ridge on the next *hono,* the border of which overlaps that of the first. Sometimes a thatcher will not complete a *hono,* but will work along one level for the length of the roof; but the correct method is to carry one *hono* straight up before proceeding to the next.

For binding the thatch (*ato*) on the rafters, a continuous cord, that runs the full length of the *hono,* is employed. At the first eave mat it is tied to the upper margin of the thatch mat and round the rafter. The cord is then carried to the margin of the next thatch mat as it is laid on, is carried over the margin, and held with the finger. A large needle (*hauato*) like an enormous crocheting hook (fig. 6, *a*) is thrust up through the *rau oro* just below the *aeho.* The needle catches the cord where it is held by the finger and draws it down through. The needle, which is attached to the right arm by a long cord, is then dropped to pull through the rest of the cord. The cord passes around the rafter at only every fourth or sixth mat. The continuous cord is made fast at the juncture of the rafter and the ridgepole. In the chief's house at Tevaitoa, Raiatea, and in many other houses there was an additional complication. From eave to ridge along the upper side of the rafter ran an *ieie* runner. The cord that bound the thatch mats was passed around this at the margin of each mat and was passed around the rafter at only about every tenth mat. The use of the *ieie* in this way gives greater strength. Sometimes stems of papyrus (*aeho*) are used in this way instead of the *ieie.*

A way of binding *rau oro* thatch for extra stability, that was seen nowhere else, was observed on the roof of a large *himene* house. Cords ran the length of the side roofs binding down the thatch on the outside, passing down through the thatch at intervals of 8 or 10 feet. There were 4 or 5 parallel rows of these, each row being about 4 feet above that below.

The appearance of the *rau oro* roofs is shown in Plates III to VIII. Such a roof will last, it is said, for seven or eight years, while the coconut thatch is good for only about half that time.

The making of the coconut leaf thatch mats (*niau*) is a much simpler and quicker process. A *niau* thatch mat consists of half a coconut frond with its leaflets interwoven in oblique checkerwork. The weaving of these is described in detail by Handy (14). Men cut down the coconut leaves and split them, but the weaving of the mat is done by women. When a suffi-

cient number of the mats have been made they are laid out on the ground to dry (14; Pl. X, *A*). This thatch is put on the roof exactly as is the *rau oro,* except that there is no need for the thatching needle as in the *niau*; the lashing can be passed through the interstices between the leaflets where they branch off the stem of the frond. Usually the eaves of houses thatched with *niau* are left ragged. But occasionally the ends of the leaflets of the bottom range of mats at the eave are turned back and plaited to give a neat finish.

Quite a different method of making thatch out of coconut leaves, one that is rarely used, however, was described to me in Borabora. The leaflets are stripped off the stem of the coconut frond. A small bamboo of the desired length is split and one half is laid on the ground with the inner side up. The upper ends of the coconut leaflets are laid upon this one after the other so that the margins of the leaflets overlap. When the whole length of bamboo is covered, the other half of the bamboo is laid upon that on the ground and the two halves, with the leaflets between, are lashed firmly together so that the leaflets are held as a pendant fringe. The thatch elements so made are lashed on the rafters exactly as are the *rau oro* or *niau* mats. This variety of thatch is termed *niau maro.*

On Raiatea Island, it is said that ti leaves were formerly used sometimes as thatching for large buildings. Nowadays these are occasionally used for sheds or shelters in the bush, but never for houses. Grass (*aretu*) was sometimes used in Maupiti for covering the whole roof of small houses.

The thatching of the ridge (*tapoi*) is the most important and most difficult part of the work of covering the roof of a native house. On roofs thatched with *niau* the ridge is thatched with layers of overlapping *niau* mats. After these have been laid on they are pinned down by means of small sticks termed *patia tapoi* thrust through the thatch mats and underneath the rod that runs the length of the ridge above the ridgepole (fig. 1, *a,* 6). The rods hold the pins and these hold fast the thick ridge matting which is lashed to them. When *rau oro* is the material used for roofing, the *Pandanus* leaf mats are sometimes put over the ridge, but this is seldom done. When *rau oro* is used thus the ridge mats are termed *aiau.* The ridge of a *fare rau oro* should properly be thatched with *aretu* grass. First, bundles of *Pandanus* leaves are laid along the rod on top of the ridge to make a raised soft base on which to lash the grass. A line made of twisted *ieie* runners is stretched the length of the roof on top of the *Pandanus.* Bunches of the grass are inserted between the loosely twisted strands of the *ieie,* each bundle being doubled back on itself and pressed down so that it hangs down one side of the ridge. Bundles of grass are thus attached to the *ieie* in this way on both sides of the ridge along its whole length. The line of *ieie* is then bound down to the horizontal rod beneath by means of a

continuous cord passing up over the *ieie* and down the rod. In lashing the ridge thatch at this point two men have to work together, one on top of the ridge, the other underneath, equipped with thatching needles for drawing the cord back and forth through the thatch. After the lashing is done, *paua* made of coconut leaves are laid on top of the grass and lashed down, to hold down the grass.

To prevent the thatch being torn and rent by high winds, Emory observed, long peeled poles of *purau,* termed *taumi,* were laid against the thatch, their butts resting on the ground. Several of these lying against the thatched roof of a native house is a not unusual sight. (See Pl. X, *A*).

WALLS AND SCREENS

Banks (1, p. 133) makes the general statement that in Tahiti "the houses were built without walls [he may mean solid walls] so that the air, cooled by the shade of the trees, has free access in whatever direction it happens to blow." Emory points out that for protection against weather and night air the Tahitians depended largely on *paua* (mats) and screens of plaited coconut leaf that could be removed or raised. In the old days, the sides of dwellings were often closed, however, for the use of the uprights and woven bamboo are said to be ancient customs. One of the Catholic fathers who went to Tahiti in the eighteenth century wrote in his journal: "One meets now and then with a house walled in with small thin canes; but they are few" (7, vol. 1, p. 278). Wallis (29, vol. 1, p. 462) mentions a large house of Purea's "enclosed in lattice work." The general popularity of closed dwellings has come with imitation of European habits of living. Walls, which seem to be integrally a part of the old Leeward Islands *fare taupee,* were probably more generally used in this section than in Tahiti.

The method generally employed in making walls, both in Tahiti and the Leeward Islands, consists in lashing a horizontal pole (*patini*), or several lashed end to end, along the outside of the wall posts, about a foot below the top of the posts. To these were tied the vertical rods (*patia* or *atia*) of *purau,* bamboo, or *aeho,* 1 inch, or 1.5 inches in diameter, and cut to the proper length. The tops of the rods were sometimes sharpened and thrust into the thatch 2 or 3 inches apart, thus insuring stability, while they were being tied on. Another *patini* was lashed, on the outside, midway between the floor and the wall plate. Thus a neat and strong lattice is formed (fig. 7, *a*). Figure 7, *b, c,* shows a typical method of lashing. Occasionally, instead of using the rod, two runners of *ieie* are twined in and out as would be done in twined basket weaving (fig. 7, *a*).

Woven split bamboo (*raraa*), forms a second type of walling much used in the Leeward Islands, but rarely seen in Tahiti (see Pl. IX, *A*). Sections of the heavy mat made of strips of bamboo are cut to fit the space to be

covered and then secured against the house posts by means of rods laid on the *raraa* where it is against a post and lashed to a post.

Walls, whether made of *patia* or *raraa* are generally continuous, being put on the outer side of the posts; but sometimes small sections of the walling are fitted in between the posts.

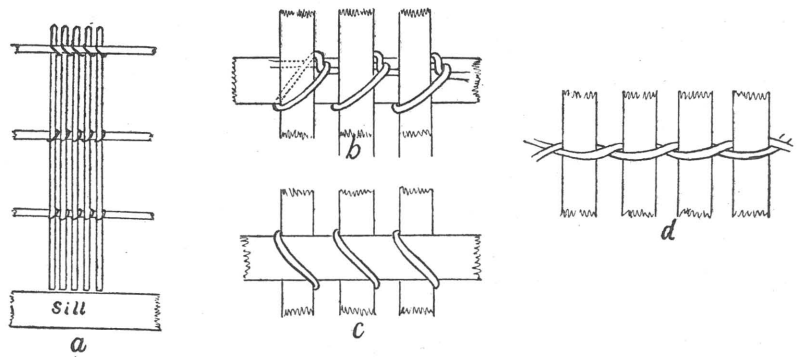


FIGURE 7.—Latticework walls made with *purau* rods or bamboo: *a,* inside of wall; *b,* detail of wall, inside; *c,* detail of wall, outside; *d,* rods held with twined *ieie.*

Modern doorways are almost always in the side of a *fare potee* or *fare taupee*; but they are generally in the end of *fare hau pape,* though occasionally they are in the side of a house of this type. Modern doors are bought ready-made or made of plank. According to information gathered in Raiatea doors were not used at all on the old *fare taupee* in the Leeward Islands. The open doorways of the walled houses were anciently called *amuna.* The word *uputa* is now used to signify doorway, while doors are termed *oponi* (English, "*open*"). I have some doubts as to the antiquity of doors described by Ellis (10, vol. 1, p. 176).

Coconut mats (*paua*) were employed in the old method of closing the sides of a house against wind and rain (Pl. VI, *A*). The making of such *paua* is described by W. C. Handy (14). In one house with open sides, that was studied, *paua* of this type were simply hung up at night when it was windy and taken down in the morning. On Huahine one house had a series of small coconut leaf *paua* slung on cords so that they could be drawn up under the eaves as is done in Samoa, but this was not seen elsewhere in the Society Islands.

A second type of *paua,* examples of which were seen only in Maupiti, is shown in Plate XII, *D.* A bamboo rod serves as the base of this type of screen. Leaves of *Pandanus,* with their butts down, are hung on either side of this rod, their ends being bent over the rod and pinned. The whole length of the rod is thus covered with leaves in pairs, back to back, the margins of

the successive pairs overlapping. In just the same way as in the *Pandanus* thatch mats the overlapping leaves are pinned together by means of bamboo splints of which, in some mats, there are three; in others four.

A simpler form of *Pandanus paua* is made by bending the butt ends of *Pandanus* leaves over a rod and pinning the leaves together just below the rod. The remainder of the leaves hang down, and their margins are pinned together with bamboo rods. These *paua* are in no way different from the thatch mats made of the same material, except that the leaf is bent on the rod, close to the butt instead of some distance below it.

Coconut leaf *paua* were sometimes bound on a frame of *purau* poles to make stiff screens (*paruru*). Such screens are now frequently used on porches or over window openings. Anciently they were one means employed to close the sides of a house, being slung from the plate by means of cords attached to the upper rod of the frame. In bad weather and at night they could be let down, while at other times they were kept raised by means of poles propping up the lower margins.

Partitions, now frequently built in imitation of European ways, were not used at all in the old days. Tapa curtains were sometimes used to close off a portion of the interior. One of the early Spanish observers in Tahiti speaks of brown tapas as being "the sort that usually serve them for bed screens" (7, vol. 2, p. 83). Vancouver (28, p. 116) describes one-half of a chief's house, in which he was entertained, as being screened off.

LASHING AND ORNAMENTATION

For lashings, cords (*taura*) of several materials were employed. The hastily made *niau* mats are generally lashed to the rafters of a house or shed simply with strips of *purau* bark (*iri purau*). This is frequently used for binding the uprights in making a wall. For this, and for certain purposes on the ridge and side roof of a house, the long flexible runners of *ieie* are used. Cord made of two strands of twisted *more* is much used for lashing both *rau oro* and *niau* thatch mats, and also in making walls. The most durable lashings are those made of coconut fiber, of which this both twisted (*tauro nino*) and plaited cords (*nape*) are used.

It is characteristic of Tahitian housebuilding that in fastening together the timbers of the frame, fitting by mortising and other types of joining (fig. 2, *a, b, c*), combined with the use of wooden pins, which are probably modern, since they are termed *pini,* to a large extent replaces the generous and elaborate use of sennit lashings typical of the Marquesas and Samoa. Ornamental lashing was used in ancient times in Tahiti, but it seems not to have been so popular as other styles of decoration. The adornment of pretentious Tahitian houses, such as the *fare putuputuraa* and the dwellings of chiefs, consisted mainly of tapa bound on the rafters, or of fine matting

having varied designs similar to those seen today on the native straw hats, woven upon the lower ends of the rafters. Ellis (10, vol. 1, p. 173) describes the ornamentation of the interior of a chief's house as follows:

> The inside of the rafters of the chiefs' houses, or public buildings, is frequently ornamented with braided cords of various colors, or finely-fringed, white and chequered matting. These are bound or wrapped round the rafters, and the extremities sometimes hanging down 12 or 13 inches, gave their roof or ceiling a light and elegant appearance.

Emory observed another survival of this decorating in the *fare putuputu-raa* at Maeva, Huahine, where the lower ends of many of the rafters are painted with bands of colors in the following order: green, white, black, red, black, white, black. These bands together take up four feet of the length.

The "extremities hanging down" probably refer to one of the old customs which today continues as a popular method of decorating interiors on festive occasions by using long ornamental fringes of white and dyed *more* (hau bast) round the walls of rooms or under the eaves of open houses. The strips of *more* are knotted into a narrow net at the top of the fringe, and at the bottom they are shredded and allowed to hang down a foot or more, and trimmed neatly in a sharp line. (See 14, Pl. XVI, *C*.)

FLOORS

It was anciently the custom in all these islands to put *aretu* grass on the floor. This made a soft and warm ground covering; but it is said that the grass, which was seldom changed, was frequently old, and damp, and infested with vermin. In the Leeward Islands the houses with raised floors frequently have the woven bamboo matting laid down on the poles used for flooring. Whether this is an ancient custom or not I do not know. In the Leeward Islands another long grass (*mau u'u rourii* in Raiatea, and *uti-uti* on Maupiti) was also used on the floor.

Sleeping mats used in the old days were for the most part woven of *Pandanus* leaves or *more;* but early writers mention also rush and grass mats (14). Mats were of all sizes, from very small ones made especially for babies, to those, some of which are said to have been as much as 100 yards long (10, vol. 1, p. 188), that were rolled up in their houses for display by the chiefs. Ellis (10, vol. 2, p. 340) describes the sleeping mats (*moe'a*) as being "rolled up like a sailor's hammock in the morning and spread out at night." On Huahine, chiefs used to sleep on a pile of fine mats on "a low bedstead raised 9 or 12 inches above the floor" with sides and bottom made of breadfruit planks (10, vol. 2, pp. 340-341).

Large sheets of heavy tapa were used as coverlets (*ahu taoto*). Father Joseph Amich described these in his journal (7, vol. 2, p. 83) as being

"doubled four or five ply thick and stuck together with some glutinous matter."

FURNISHINGS

The native pillow (fig. 8, *a*) is described as follows by Ellis (10, vol. 1, p. 188):

> This was of hard wood, and often exceedingly rude, though sometimes ingeniously wrought, resembling a short low stool, nine inches or a foot in length, and four or five inches high. The upper side was curved, to admit the head; the whole pillow, which they call tuaurua, is cut out of a single piece. Upon the bare wood they reclined their heads at night, and slept as soundly as the inhabitants of more civilized parts would do on the softest down.

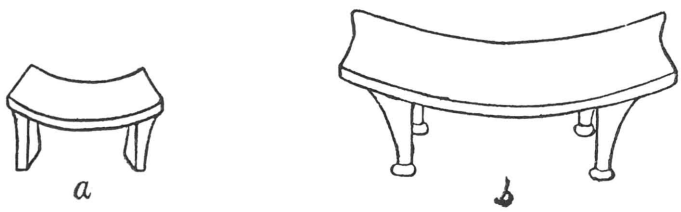


FIGURE 8.—Tahitian house furniture: *a*, pillow; *b*, seat.

According to Captain Cook (4, p. 96), a bundle of cloth or a block of wood sometimes served as a pillow.

Another piece of furniture typical of the Tahitian home in the old days was the low seat (fig. 8, *b*) belonging to the master of the house. Ellis writes (10, vol. 1, pp. 189-90):

> In general, they sat cross-legged on mats spread on the floor; but occasionally used a stool, which they called *iri* or *nohoraa*. This resembled the pillow in shape, and, though much larger, was made out of a single piece of wood. The *tamanu*, or *callophylum*, was usually selected, and immense trees must have been cut down for this purpose. I have seen iris four or five feet long, three feet wide, and each end three feet six inches high; yet the whole cut out of one solid piece of timber. The upper part was curved, and the extremes being highest, the seat resembled the concave side of a crescent, so that, however large it might be, only one sat on it at a time. The *iri* was finely polished, and the wood, in its grain and color resembling the best kinds of mahogany, rendered it, although destitute of carving or other ornament, a handsome piece of furniture in a chieftain's dwelling. The rank of the host was often indicated by the size of his seat, which was used on public occasions, or for the accommodation of a distinguished guest. Those in more ordinary use were low, and less curved, but always made out of a single piece of wood.

In the middle of the floor of every house was a *fata* described by Ellis (10, vol. 1, p. 192) as a "single, light post planted in the floor." On the beams and elsewhere were hung personal and family possessions: rolls of cloth, musical instruments, weapons, fishing tackle, and other properties.

PRECINCTS

Accounts differ as to the neatness of the precincts about the native dwellings. There was probably here as much individual variation in the matter of pride in appearance and aesthetic interest as there is among other peoples, but it is worthy of remark that several of the best of the early observers went out of their way to remark upon the attractiveness of the better class of native dwellings.

Captain Bligh received a very poor impression, due probably to the fact that he was contrasting the inevitably unkempt general appearance of a native tropical settlement with the prim neatness of an English village. Bligh remarks (16):

> cleaning and keeping their grounds free from weeds is beneath the care of an Otaheitan. They have as little neatness about their dwellings; an Otaheitan village—if their mixed dwellings may be so called—is the dirtiest place imaginable. Everything is thrown down before and around the house . . . yet no person in the world is cleaner in his person.

Vancouver (28, p. 116) was very favorably impressed, and describes the appearance of the house of a chief by whom he was entertained:

> situated on the verge of the seashore. In front of it was an *ava* plantation, interspersed with sugar cane, and bananas; near the house was a small shrubbery, of native ornamental plants. The whole surrounded by a well constructed fence of bamboo, neatly intersected with clean paths, that led in different directions, produced an effect that was extremely pleasing, and redounded much to the credit and ingenuity of the proprietor.

The following, written by Ellis (10, vol. 1, pp. 176-7), would seem to indicate that such attractiveness as was described by Vancouver was the rule, rather than the exception:

> Every chief of rank, or person of what in Tahiti would be termed respectability, has an enclosure round his dwelling, leaving a space of ten or twenty feet width within-inside. This court is often kept clean, sometimes spread over with dry grass, but generally covered with black basaltic pebbles, or *anaana,* beautifully white fragments of coral. The *aumoa* is a neat and durable fence, about four feet high; the upright pieces are tenoned into a polished rail along the top, or surrounded with the straight and peeled branches of the *purau* or *tamanu.*

Nowadays many natives give a good deal of attention to the appearance of their yards, keeping them clean and weeded, having flowering plants, crotons, hibiscus, *tiare,* ti, and the like planted in or around them. In the time of the well-known chief Ori, during the latter part of the last century, the village of Tautira, Tahiti, was noted for its attractiveness, in which Ori took much pride, as I am told most Arii formerly did. Now there are few villages that make any pretense at neatness. Mahaena, Tahiti, was the

best kept of all those I saw in 1923. But it is Borabora that at present preserves more of the old pride in appearance than any other island.

A fence of straight, flexible, peeled *tamanu* rods, about 3 feet high, and constructed undoubtedly after an ancient technique, was seen by Emory about a dwelling on Maupiti. Pairs of rods planted in the ground were bent around two rails, following one or the other of the two methods shown in figure 4, *c*. No lashings were necessary in such a fence, the pressure of the twisted rods holding the rails in place and the rails holding the vertical rods in place.

The low fences of bamboo described by early visitors and depicted by Webber (6, Pl. 6) were prototypes of the low fencing of bamboo running between or around the side posts of some of the cookhouses to be seen today.

USES

A word should be said about the uses of the different styles of houses that have been described. For dwellings in the old days, both the *fare hau pape* and *fare potee* types were used in Tahiti, while in the Leeward Islands the arch-ended *fare taupee* was used most, although here, too, the *fare hau pape* was also made. Apparently many of the natives in pre-European days lived in mere thatched huts, which would generally be of the *hau pape* form. The large *fare potee,* such as those now used for assembly houses, government houses (*fare hau*), schools (*fare haapiiraa*), and houses for singing hymns (*fare himene*), served formerly as residences of chiefs (*fare arii*), and as assembly houses of communities (*fare mataeina'a*), lodges of the *arioi* (*fare arioi*), warriors' houses (*fare aito*), and so on.

There are several special forms that must be mentioned. In the first place there was a special type of house that was used for the performances of the dramatic dances (*heiva*). According to the account of the visit of the ship *Duff* (31, p. 370):

> The houses in which the *heivas* are performed are open at the ends and in front, the back being screened by matting of coconut leaves; round the ends and in front of the house there is a low railing of about a foot in height, within which the performers exhibit; and without, the audience sit or stand; the area before the house and the floor are all covered with matting.

Another special type of structure was the *fare oa,* which was a little house consisting of a portable frame covered with *niau* that was carried about for the accommodation of a travelling chief. At sea, it was lashed on the platform of his boat; when he landed, it was carried ashore with him. The custom was intended in part, no doubt, to protect the chief from the dangers of sleeping in strange places, but was largely due to the belief that a chief's sleeping in any house but his own would make it so tapu that its true owner must abandon it.

CEREMONIALS

Little is know about the social and religious aspects of the housebuilding industry, for the natives living today remember very little, and the old accounts tell less, concerning this. There seems to have been less ceremonialism connected with housebuilding here than in either the Marquesas or Samoa, and less than with canoe building. In the erection of a family dwelling a man's family connections (*fetii*) were called on to contribute materials and labor. Men cut and carried the timber, erected and thatched the frame, made the lashing cord, and—if it was to be a *rau oro* house—the thatch mats. When *niau* was used, the women were called on to weave the mats after the men had collected the leaves for them. Those assisting with the work were entertained with a feast of pig when the work was done. Nothing is known of a ceremonial opening of a common dwelling.

When it was a chief's house that was built, or an assembly house, all the community shared in the labor. The chief assigned parts of the work to different groups. Some were ordered to bring timbers; others prepared cord and thatch; and all joined in putting together the large houses. On Borabora, for example, the chief would summon his body of men (*amuiraa*) and assign to each man 200 *aeho* of *rau oro* and 10 fathoms (*umi*) of cord, stipulating the kind desired and the day they were wanted. It is said that one man could make one *tihope* or 200 *rau oro* in a day; but before the *rau oro* were made much time was required for gathering and preparing the *Pandanus* leaves. A man would probably assign the making of cord to other members of his family.

When a large communal house, such as an assembly house or that of the chief, was completed on Maupiti, there was celebrated the *oroa haoraa fare* (house entering feast). The house, after completion, was closed and no one was allowed to enter it. The population then assembled; the chiefs of the island brought two hogs each, while all the people brought contributions of other foods. A eulogistic song was sung in honor of the name of the new house. Then it was opened, and the chiefs entered first, followed by the people. Then followed the feasting.

The god of housebuilders under the old religious system was Tane-i-te-ha'a, while Neia and Topea were patrons of thatchers, "especially of those who finished the angles where the thatch on each side joined" (10, vol. 1, p. 333; 19, vol. 1, p. 453). Evidently this work of finishing the thatch was expert's work, done by a professional.

SUCCESSION OF TYPES

It is my belief that the rectangular *fare hau pape* with end posts supporting the ridgepole represents the ancient form of dwelling in these islands. The form of frame that belongs to this house is constant throughout the

Society Islands, appearing in the *fare hau pape,* and in the body of the *fare potee* and *fare taupee.* The use of the tiebeam and king-post, instead of central supporting posts is a minor detail—the rectangular shape and type of construction remains the same.

According to Te-rai-tua, the first round house (*fare pau taa*) was built on Tahaa by the grandfather of Hiro. Emory, in a personal communication, asks, "If the round house was introduced by the Hiro family, why have not the Maoris or Hawaiians a trace of it?" To this the answer is: "No less an authority than the Rev. Orsmond (15) presents a tradition that Hiro introduced the form of boat called 'pahi'." There is no trace of this either in Hawaii or New Zealand.

A careful analysis of the structural features of the *potee,* or rounded end, and the *taupee,* or arched end, seems to indicate that these are adjuncts added to the original form of frame, and that the *taupee* is nothing more than a flattened *potee* whose curved plate has been set to form an arch instead of an arc, and whose rafters have, in consequence, been laid parallel to one another instead of radiating from the end of the ridgepole. The round-ended or apsidal form, typical of Samoa and Tonga also, is probably attributable to the Ta'aroa Arii.

Emory points out that in the Samoan rounded-end house, the end rafters are parallel to each other, yet the plate is horizontal, whereas, in the arrangement of rafters and purlins in the Society Islands, the form is fundamentally different. He considers that it is logically much easier to derive the Samoan roof form from the *taupee* than to derive the *taupee* from the *potee.* From the point of view of distribution, however, he agrees that the *taupee* would appear to be in the Society Islands the later.

This contrast which Emory indicates, in construction of the rounded roof ends of the Tahitian and Samoan houses, must not be overlooked; nevertheless, the fact remains that the apsidal form of the ends of the house itself, irrespective of the manner of making the roof, is typical of the three island groups; Samoa, Tonga, and the Society Islands, where the *arii* culture was most clear-cut; and that these apsidal ends are characteristic especially of the assembly houses that were distinctly the property of the chiefs, and of the residences of *arii.*

FOUNDATIONS

As regards foundations, the earth and stone *paepae,* such as are found in the interior valleys of Tahiti, Moorea, and Raiatea, and on Maupiti, certainly represent an old type, while the wood platform elevated on posts, found in the coastal region of the Leeward Islands, would seem to be of more recent origin. That the pile house was introduced when the Ta'aroa Arii came to these islands appears unlikely for it is not typical of their establishments here, nor of the other island groups, such as Tonga and Samoa,

where their influence is strongest. This may be another instance of a recently borrowed trait. Or it may be a local adaptation, for dwelling purposes, of the old Polynesian storage house raised on posts.

Emory notes that the wooden platform should not be termed a foundation, but a house-floor, for it plays no part in supporting the house frame. He believes that it is certainly a post-European innovation, and inclines to concur with Stokes that it may have been borrowed from Papua, being introduced by some of the Tahitian or Leeward Islands natives who are known to have gone to New Guinea as missionaries.

BOATS

TERMINOLOGY

TYPES

Pahi.	Leeward Islands' built-up boat.
Pu ho'e.	Small dugout.
Reho.	Raft.
Tipairua.	Double canoe.
Va'a.	Tahitian canoe.
Va'a ti'i.	Sacred canoe.

PARTS

Ama.	Outrigger float.
Apae.	Sides.
Apae no mua.	Bow piece of built-up boat.
Apae no muri.	Stern piece of built-up boat.
Auaha.	Inside of hull.
Auau.	Sides.
Huhui.	Gunwale of *va'a*.
Iato.	Outrigger rods.
Iato mua.	Forward outrigger support.
Ie.	Sail.
Ihu va'a.	Projecting bow.
Maihu.	Bow piece (Huahine).
Mua.	Bow.
Muri.	Stern.
Nape.	Sennit lashings.
Noo.	Stern piece (Huahine).
Oa.	Side board of *pahi*.
Oiri.	Lashings, to lash.
Oma.	Adze (modern).
Pae.	Side sprit on sailing canoe.
Pae mua.	Forward part of boat.
Pae muri.	After part of boat.
Patea.	Oblique sprit across sail.
Patini.	Gunwale of *pahi*.
Raau taamu ie.	Stern sprit of sailing canoe.
Raau pumu (modern).	Boom.
Rei.	Point of bow, above cutwater.
Rei mua.	Figurehead on bow of ancient boats.
Rei muri.	Figurehead at the stern.
Taere.	Bottom of hull.
Tamuri.	Same as *iato muri*.
Taura nape.	Rope made of sennit.
Ti'ati'a.	Uprights attaching the float to the forward outrigger rod.
Tinoa.	Hull of *pahi*.
Tira.	Mast.
To'i.	Adze.
U.	Pegs on the outrigger float to which the after support is lashed.

MISCELLANEOUS

Hoe.	Paddle.
Hoe fa'a-tere.	Steering paddle.
Fa'a-tere.	Steersman.
Ra'o.	Rollers of coconut trunks. Paddlers.
Tataa.	Bailer.

MATERIALS AND TOOLS

The best woods for making the keel or hull of a canoe are *tamanu* and *mara;* but other woods that are commoner and more easily worked are much used today: breadfruit, coconut, *vi, (Spondias dulcis)*, mango, *hutu (Barringtonia speciosa)*, and *tou (Cordia subcordata)*. *Purau,* though very inferior in lasting quality, is frequently used now for the small fishing dugout, for it requires little labor to cut a small hull out of its wood.

For lashing and sewing, sennit has always been the standard material; it is durable even when continually soaked, and it does not stretch. Instead of sennit commercial fishline is now frequently employed in lashing outriggers. Occasionally *ieie* runners are used on outriggers.

In ancient times, when stone and bone were the only materials available for making implements, polished adzes and chisels made of hard basalt, and chisels, gouges, and awls made of human bone, were the implements upon which the canoe maker had to depend. The adze heads, which were lashed *(oiri)* on bent handles of *mape* or *miro* wood, were of various sizes, from very large ones weighing many pounds, employed in felling trees, roughing out and dubbing, to the small ones used in finishing and carving. The smaller-sized stone heads, hafted end on, served as chisels. Chisels and gouges were made also of human bone. The craftsmen who used stone tools had continually to be sharpening them as they worked. Wallis (29, p. 487), in describing carpenters at work, wrote: ". . . every man has beside him a coco nut-shell filled with water, and a flat stone, with which he sharpens his adze almost every moment." In pre-European times holes were bored by means of an awl made of a pointed piece of bone hafted upon the end of a wooden shaft. As soon as the early voyagers had supplied the natives with spikes and nails these were substituted for the bone points. Forster (12, p. 461) describes saws made of "a part of the sting-ray's skin fastened round a piece of wood" as being part of the old carpenter's kit. The smooth finishing and fine polishing of hull and sides, for which the old canoes are famous, was done with shells used as scrapers, beach stones and chunks of smooth coral as rubbers, and wet powdered coral or sand as polishing material.

Nowadays trees are felled and lengths of trunk cut out with the aid of steel saws or axes; while the roughing out and finishing is done with axes and steel adzes. The holes for sewing and lashing are burned with red-hot metal rods, or bored with an auger.

TYPES

Three types of craft used in the Society Islands have been indiscriminately termed "canoes": small dugouts, built-up canoes with round bottoms, and composite vessels with sharp keel. All three types depended upon an

outrigger for stability, except when two hulls were lashed together to make a double canoe.

Dugout

The small, simple, one-piece dugouts were—and still are—made for fishing within and near the reefs. These were termed *pu ho'e* (single, or paddling shell), but are generally referred to now as *va'a*. They have rounded bottoms, a slightly elevated bow and stern, a convex cutwater, and a pointed stern, the underside of which forms a long curve up from the keel (Pl. XIII, *B*). The lines of the built-up canoe (Pl. XIV, C) are typical also of the small one-piece craft with outrigger attached. The hull of the *pu ho'e* is framed along the upper margins by a thin strap forming a small gunwale. In Raiatea and Huahine there have been observed, by Emory and myself, several additional gunwales made of *purau* poles cut out on the underside so as to fit over the canoe sides (Pl. XVIII, *C*). Emory writes that on Huahine these enable the canoe polers to stand upon the sides of the craft as they propel it.

Built-up Canoe

The ancient Tahitian built-up boat (*va'a*), consisted of a large hull shaped like that just described, made sometimes of a great hollowed log, but in larger boats, of several sections, hollowed out and fastened together, to which were added side boards and bow and end pieces. The hulls thus made were used singly, balanced by an outrigger; or two were lashed together to form a war canoe or ceremonial canoe. The bottom of the *va'a* was smooth and round, the sides perpendicular, rounding a little at the gunwale. Their depth is said seldom to have exceeded 3 feet, and their beam 21 inches. The after part was generally about one-third wider than the forward part (4, p. 97). Concerning the size of the ancient *va'a* Banks writes (1, p. 157): "I have measured them from 10 feet to 72 feet, but by no means proportional in breadth, for while that of 10 feet was about one foot in breadth, that of 72 feet was scarce 2 feet, nor was their height increased in much greater proportion."

The bow piece of the old *va'a* is described by Ellis (10, vol. 1, p. 156) as consisting of a "solid piece, cut out of the trunk of a tree . . .", on top of which was fixed a "thick board or plank [that] projected horizontally, in line parallel with the surface of the water. This front piece, usually five or six feet long, and 12 or 18 inches wide, was called the *ihu vaa,* nose of the canoe, and without any joining, comprised the stern, bows, and bowsprit of the vessel." (See Pl. XV, *A*.)

Emory, in the course of his work in 1925 on Huahine, discovered and studied a number of bow pieces, similar to those described by Ellis as follows:

On Huahine Island we saw six specimens of the horizontal, plank, bow-piece, called by the present natives *ihu*. . . . Two canoes with *ihu* are still in use on Maeva lake [see Pl. XVIII, *A, B, C*], another such canoe lies on the beach at Teatai, Haapu. A bow-piece alone was found at Maeva, another at Fare, and a third at Parea village . . . the latter was transported to the Papeete Museum. Thirty years ago this feature of an *ihu* was almost universal on Huahine but is now displaced by the bow-piece which simply elevates the bow with the sharp cut-water.

This *ihu,* as observed in four specimens, is a horizontal plank one to two inches thick, 10 to 13 inches wide, 5.5 feet to 8.5 feet long. The plank caps the bow and projects 3 to 4 feet beyond the cutwater, by means of a

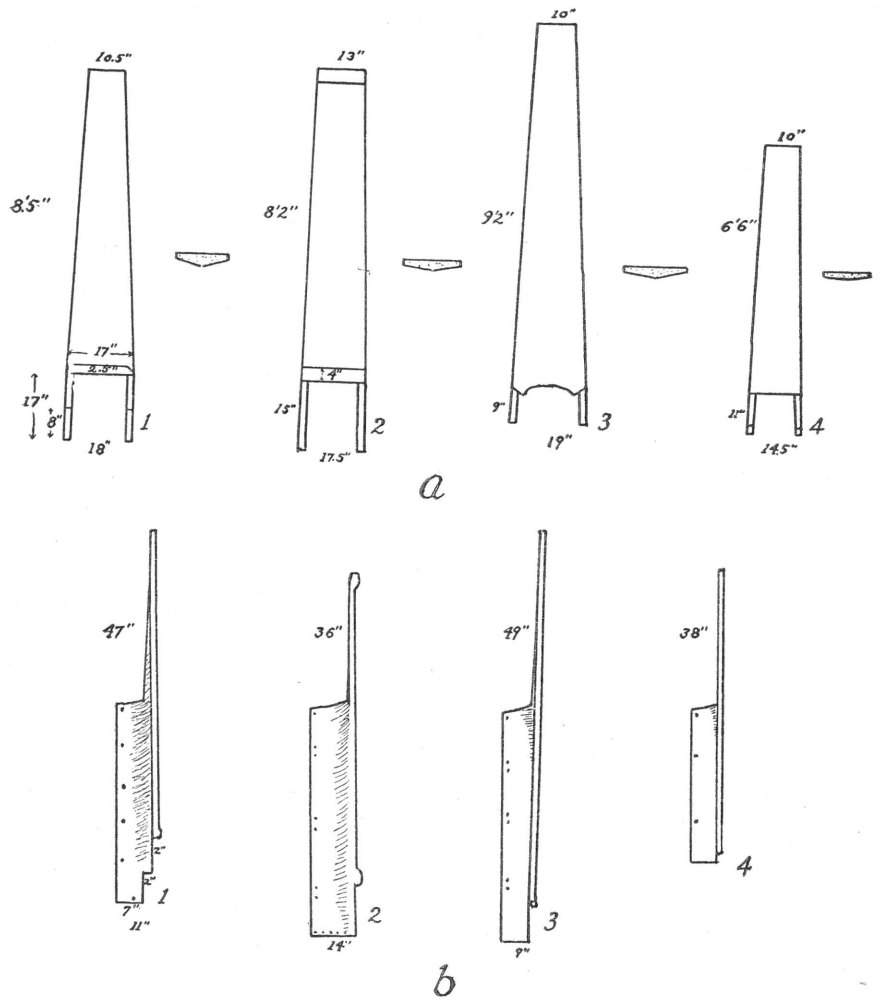


FIGURE 9.—Detail of projecting bow piece of Huahine canoe: *a*, top view; *b*, side view: 1, at Haapu; 2, at Fare; 3, at Maeva; 4, at Parea. (Drawings by K. P. Emory.)

broad *V*-shaped flange on the bottom which raises the sides and the end of the canoe 7 to 14 inches. The flange projects backward in two wings 9 to 17 inches long, where it meets the side planks (*oa*) of the canoe, and is joined to them as well as to the canoe body by lashings of sennit. All is carved in one piece from a block of *uru* (breadfruit) wood. The lashing holes are about 1.5 inches from the edges, and are circular, 0.5 to 1 inch in diameter. They are arranged along the side at intervals of a span, singly or in pairs, an inch apart.

The top of the plank is perfectly flat, but the bottom is usually in the shape of a very flat "V": a central ridge runs from the front to the back and along this line the plank increases in thickness from 1 inch to 3 inches, but the edges of the plank remain of the same thickness throughout.

At the inner end of two planks there is on the top a fret several inches wide and 1 inch high. This fret also occurs on the front end of the specimen from Fare. The front ends of the horizontal planks are cut off square, and the rear ends also of the planks, except in the specimen from Maeva, which is deeply concave. The outer sides of the *V*-shaped flange which joins the plank to the canoe are vertical in the specimen from Maeva village, but curved outward from below upward in the specimens from Lake Maeva, from Haapu, and from Fare. (See Pl. XVIII, *B, C;* fig. 9.)

Ellis (10, vol. 1, p. 156) describes the stern of the *va'a* as being "considerably elevated, the keel was inclined upwards, and the lower part of the stern was pointed, while the upper part was flat, and nine or ten feet above the level of the sides."

On Huahine, Emory was able to study the stern of an old canoe, which he describes as follows:

A canoe body 24 feet long, rotting on the beach at Vai-riri, Tefarerii District, Huahine Iti has a stern [Plate XVIII, *A*] similar to that described and figured by the visitors to the Society Islands a century ago,—though a very inferior one. This canoe, which is of durable *ati* (*Callophylum inophylum*), was in use about twenty years ago and is said to be the only example left on Huahine of the *no'o* or flat stern of the old canoes.

The canoe body is in two sections: the front section, 14 feet, 3 inches long; the rear section, 10 feet 1 inch long. The front half is similar to that of the present canoes. The bow piece is missing, but was presumably of the old type: the horizontal, plank, bow piece.

The rear section of the canoe body differs radically from that of the present canoes. It is proportionally wider, lower, and flatter at the bottom. Also the sides curve slightly inward towards the top, and extend backward approaching each other only by being three inches closer at the rear end. It was, however, joined to the front half of the canoe body in the usual manner: the lower half of the front end is cut back for 14.5 inches; the front section of the canoe body is reciprocally cut. The edges of the joints so formed are not grooved or rabbeted, but are flat. Circular lashing holes, ½ to ¾ inches in diameter have been bored an inch to 1.5 inches from the edges: their number and placement are shown in the illustrations.

The thickness of the shell varies: it is 1⅛ inches to 2 inches along the upper edges. The bottom is slightly thinner, but this may be due to the wear from grinding on the beach and reefs. The bottom of the canoe is smoothly rounded both inside and out, there is no raised keel. The keel curved upward towards the back and projected out of the water.

The broad rear-end of the canoe terminates in a broad, flat, stern (a slight convexity, both up and down and sideways, is discernible in the stern). This stern leans

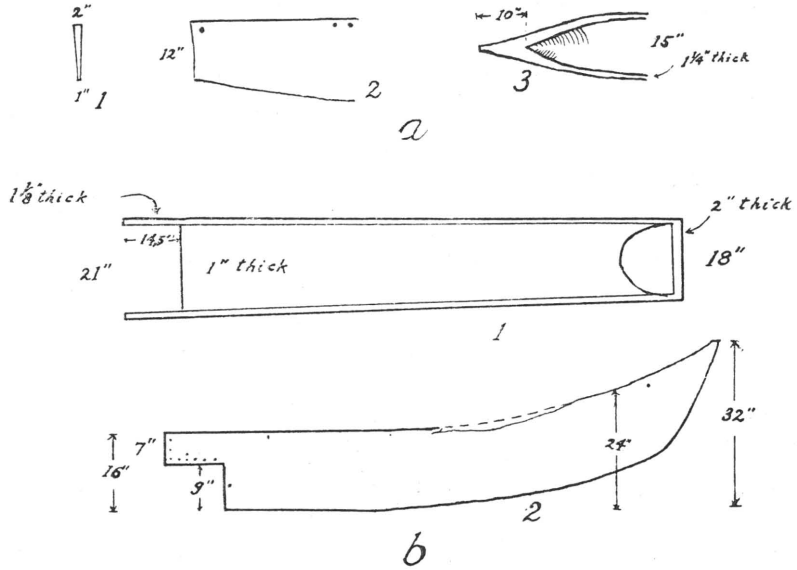


FIGURE 10.—Details of old canoe at Vairiri, Huahine: *a*, bow: 1, nose; 2, profile; 3, top; *b*, rear section: 1, top; 2, left profile. (Drawings by K. P. Emory.)

backward at an angle of 27° from the perpendicular. The top edge is horizontal and flat, the bottom is rounded.

There are no lashing holes along the top edge of the stern to suggest that it was built up any higher by an adjoining piece, but the sides of the body have three sets of lashing holes: the first at 16 inches from the rear end, the second about midway, and the third about two feet from the front end. These may have been for sideboards; although, one would expect a great many more lashing holes.

SAILING CANOES

The sailing canoes now used in the Leeward Islands, though termed *pahi,* do not conform in shape to the ancient *pahi,* in that they have a round bottom or hewn hull instead of a *V*-shaped keel, and perpendicular, instead of bulging, sides. In those two essential characteristics, the modern boats are distinctly built-up *va'a.* Only in one way do some of them resemble the old *pahi,* namely in the composite nature of the sides, which are sometimes made of a number of small pieces. The hull of such a modern sailing canoe was observed on Borabora (fig. 13 *a*). The shape of hull, bow, and stern of these built-up

canoes (Pls. XIV, *C*, XVI) corresponds entirely to the smaller dugouts seen today throughout the Society Islands. From these they differ only in having hulls sometimes made of several pieces, and built-up sides and ends.

Composite Keeled Ship

The built-up vessel (*pahi*) of the Leeward Islands was quite a different craft from the *va'a*. The difference is partly to be explained by the fact that large trees, suitable for making the large hulls typical of the old Tahitian *va'a* were not available in the Leeward Islands, as they were in Tahiti. But the difference in form is not to be entirely explained by this. The *pahi* was a wholly different style of boat, and was, I am convinced, introduced by an experienced boat-building and seafaring group of immigrants. According to Ellis (10, vol. 1, p. 170), the *pahi*, though built of smaller pieces of wood, were "much superior both for strength, convenience, and sustaining a tempest at sea." This type of craft is no longer made in the Society Islands.

Banks (1, pp. 115-16) gives a detailed description of a *pahi* that he observed on Raiatea:

> Her extreme length from stem to stern, not reckoning the bending up of both those parts, 51 feet; breadth in the clear at the top forward, 14 inches, amidships 18, aft 15; in the bilge forward 32 inches, amidships 35, aft 33; depth amidships, 3 feet 4 inches; height above ground, 3 feet 6 inches; her head raised, without the figure, 11 inches; her stern, 8 feet 9 inches; the figure, 2 feet. Alongside of her was lashed another like her in all respects, but smaller in proportion, being only 33 feet in her extreme length. The form of these canoes can better be shown by a drawing than by any description; the annexed may serve to give some idea of a section [fig. 12, *c*]: *aa* is the first seam, *bb* the second, *cc* the third. The first stage, or keel under *aa* is made of trees hollowed out like a trough. For this purpose they choose the longest trees they can find, so that two or three form the bottom of their largest boat (some of which are much larger than that described here, as I make a rule to describe everything of this kind from the commonest size). The next stage, under *bb*, is formed of straight planks about 4 feet long, 15 inches broad, and 2 inches thick. The third stage, under *cc*, is made like the bottom, of trunks of trees hollowed out into its bilging form. The last stage, above *cc*, is formed also out of the trunks of trees, so that the moulding is of one piece with the planks.

Several interesting notes are added to this account by Cook's description of the *pahi* (4, p. 98).

> They are built of several pieces of thick plank and put together as the others [va'a] are, only these have timbers in the inside, which the others have not. They have high curved sterns, the head also curves a little, and both are ornamented with the image of a man carved in wood, very little inferior [to] work of the like kind done by common ship carvers in England.

Plate XVII gives a very clear, and presumably accurate, idea of the *pahi* type of boat. In size and construction such a hull is obviously out of the category of "canoes." A boat like this deserves the term "seagoing vessel." Beyond the explanatory notes on Plate XVII there is no further detail

concerning the construction of craft given in Cook's description of the voyage. This particular double *pahi* belonged to Tu and apparently was being built in Tahiti, which suggests that *pahi* were sometimes built there. It does not necessarily follow, however, that this was a usual occurrence for there were several reasons why Tu might have had a Raiatean boat built in Tahiti or have imported one. This chief's inordinate ambition might have led him to build a very large double *pahi* such as this, to excel his rival chiefs. In the second place, Tu had family connections in Raiatea, whence he might have brought craftsmen to make a *pahi* for him. And finally, Tu's family belonged to the Tuamotus, where this type of composite boat was also used. But quite apart from the question of how and why it came about that a large *pahi* was built in Tahiti, where the *va'a* type prevailed, there is no question but that these *pahi* shown in Cook's plan are true to the old model of the Leeward Islands.

Tradition has it that the first *pahi* was made by Hiro, but this may not be of any historical significance, for Hiro has gained such fame in this group that all sorts of marvels are attributed to him. Nevertheless, the fact that the *pahi* is probably attributable to the *arii,* and that Hiro was also certainly an *arii* hero, gives added interest to the story as regards its possible ethnographic implications.

Teuira Henry (15, p. 539) says, in describing Hiro's building of the first *pahi* in order to make a trip from Tahiti, whither he had been sent for schooling when a boy, to Raiatea, "He built himself a big canoe with a keel and planks sewn together, which was the first of the kind ever made in the Society group, and he named it Pahi, as ships of all kinds have since been called."

After a lifetime of adventure, mostly maritime, tradition relates that this sea-roving *arii,* the greatest navigator and explorer of his stock and country, "resolved to build himself a greater ship for his voyages than any that had been seen before." Aided by two experts, Memeru and Mata'i-e-ha'a, Hiro by wile took from the domain of the Arii Puna in the Tu-mata-ri'i valley on Raiatea the materials for making his great ship: *avai* (*Panax*), *mara-uri,* (dark *Nuclea*), *mara-tea* (light *Nuclea*), *toi* (*Alphitonia*), *hauou* (*Fragraea*); *tamanu* (*Callophyllum*), split for planks for the bows, and branches trimmed for outriggers and cross bars; *miro* (*Thespesia*), for planks of the afterpart; *uru* or breadfruit (*Artocarpus*) for deck houses; *fau* (*Hibiscus tiliacaeus*) for paddles and floor planks; and *hutu* (*Barringtonia*) for masts.

Henry (15) goes on:

> Amid all the required ceremonies and prayers and good omens, they set to work. On rising ground they erected a great shed thirty fathoms long, six wide, and five fathoms high, facing the sea endwise. The builders had their baskets of axes and adzes of stone, gimlets of coconut and sea shells, and sennit of fine tight strands, pre-

pared and consecrated to the god Tane for this special purpose. Hiro marked out the keel, the knees, the beams, and the planks, and the men cut them into shape. All the material for the work was carefully sorted and handily placed in the shed, Hiro passing it to the men as they required it.

They set the keel of avai, toi, and mara wood, polished and firmly spliced together with hard spikes of wood secured with sennit, upon rollers in the shed and painted it with red clay mixed with charcoal so as to preserve it from wood borers. Then they fastened the knees onto the keel with spikes and sennit. Holes were bored into the keel and planks at even distances apart, and the men set to work in the following order: Hutu, the chief of Hiro's artisans, worked on the outer side to the right of the canoe, and Tau-mariari, his assistant, worked on the inner side; Memeru, the royal artisan of Opoa, worked on the outer side to the left of the canoe, and his assistant, Ma'i-hae, worked on the inner side. Each couple faced each other, fixing the planks in their places and drawing the sennit in and out in lacing the wood together; and the canoe soon began to assume form, the bows facing the sea.

Every seam and all the little holes in the wood from the keel and upwards were well calked with fine coconut-husk fiber and pitched carefully with gum, which Hiro drew from sacred breadfruit trees of the marae, and when all the streaks were on the canoe was washed out clean and dried well and painted inside and outside with red clay and charcoal. As the hull of the canoe reached almost to the roof, the builders could work no longer within the shed, and so they broke it away. Then the boards of the deck were set upon the beams and fixed in their place with spikes and sennit, and the *ama* or outrigger of tamanu wood, which had been well steeped in water to preserve it from borers, was polished with limestone and firmly lashed with sennit on to the left side of the canoe, the upper attachment of wood forming across each end of the canoe a beam, called the *'iato,* and lashed on to the right side in the same manner as on the left side.

Next came the finely carved towering ornaments for a *reimua* (neck-in-front, the figurehead) and a *rei muri* (neck-behind, stern ornament), which were fastened on to their respective places, and they were named Rei-fa'aapiapi-fare (Necks-filling-up-the-house), because the shed was broken away to allow placing them and finishing the canoe. The two deck houses, called *oa mua* and *oa muri* (fore house and aft house), were then set in their places and thatched with fara leaves, after which Hutu, the chief artisan, cut out the holes in the deck and down in the keel, in which he stood the three masts, before mentioned, which had been steeped in water, well seasoned, dried, and polished.

Then the canoe was completed. Hiro dedicated it to Tane, naming it Hohoio (Interloper), in commemoration of the manner in which the material for building it was obtained from King Puna's land. Finally the day arrived for launching the canoe, and a great multitude assembled to see the wonderful sight. The props were removed from the sides of the canoe, and the men held it ready to launch over the rollers. Hotu invoked the gods Ta'aroa, Tane, Oro, Ra'a, Ro'o, and Moe, to their aid, and soon their presence was felt impelling the canoe. The rollers began to move, and then the canoe went forwards, slowly at first as the men's hands steadied it and then swiftly and well poised as it gracefully descended alone and sat upon the sea, which rose in great rolling waves caused by a wind sent to meet it by the aster Ana-mua (Antares in Scorpio), the parent pillar of the sky. The spectators greatly admired Hiro's ship and raised deafening shouts. Then the canoe was made to drink salt water; it was dipped forwards and backwards in the waves of the great moving altar of the gods and thus consecrated to Tane. A marae was made for him in the little house aft of the deck, and the three masts were rigged with ropes and strong mats for sails and long tapa pennants streaming from them.

Within a few days the canoe was loaded with provisions. Great fish baskets were made of bamboo, filled with many kinds of fish, and attached to the outside of the canoe so as to be in the water. Bamboos and gourds were filled with water and stowed

away on board, and there were *fe'i* bananas, taro, and *mahi* (fermented breadfruit) in abundance. A bed of sand and stones was made upon the deck, upon which to make a fire for cooking the food, and soon Hiro was ready to go to sea. Hiro was the captain and pilot and he had other competent seamen, who like him were acquainted with the heavenly bodies and their rising and setting. Women and children also accompanied their husbands and fathers on board, and on one fine day, with a strong favorable wind, they set sail, applauded by many spectators, among whom were prisoners of war (called titi), whose shouts were heard above all others. They saw Hiro's great *pahi* sail out to sea and disappear beyond the horizon, never again to return to Tahitian shores. Thus ended Hiro's work in his native islands.

TWIN HULLS

Both the *va'a* and *pahi* types of craft were used to make great pontoon rafts or double canoes consisting of two hulls lashed together about 4 feet apart by means of stout crossbars. On the crossbars were laid poles forming a rough deck; sometimes an elevated platform was added, and a thatched hut or awning. Plate XVII reproduces plan of the double *pahi* of the *arii* Tu of Pare, the details of which were evidently taken down on the spot by Cook himself, or his artist Hodges. So far as I can see the plan is accurate as to details, which is not necessarily true of the drawings published with the accounts of early voyages. There is only one detail that I mistrust, and that is the design representing the carving on the pillars and platform. These were possibly done by the draftsman from memory or description, for it is unlikely that such details would have been copied on the spot as accurately as the dimensions and structure of the craft were recorded.

The plan illustrates the manner of making a deck covering the two hulls and the intervening space. In this craft, the deck ran the full length of the canoe. The following description by Ellis (10, vol. 1, p. 153) indicates also decks running the full length of the craft.

> In some of their canoes, and in the pahi among the rest, a rude sort of grating, made with the light but tough wood of the bread-fruit tree, covered the hull of the vessels, the intervening space between them, and projected a foot or eighteen inches over the outer edges. On this the rowers usually sat; and here the mariners, who attended to the sails, took their stations, and found it more convenient and secure than standing on the narrow edges of the canoes, or the curved and circular beams that held them together.

Another description by the same writer (10, vol. 1, p. 157), explains the use of the flat projecting pieces typical of the ancient *va'a*. It appears likely that it was because of this utility, in making such a deck when two hulls were lashed together, that this form of *ihu* was invented and used.

> The space between the two bowsprits, or broad planks projecting from the front of our canoe, was covered with boards, and furnished a platform of considerable extent; over this a kind of temporary awning of platted cocoa-nut leaves was spread, and under it the passengers sat during the voyage.

Cook (4, p. 98) describes a platform on the fore part of double war canoes, upon which the warriors stood.

> Upon the Forepart of all these large double Proes was placed an Oblong Platform about ten or twelve feet in length, and six or eight in Breadth, and supported about 4 feet above the Gunwale by stout Carved Pillars. The use of these Platforms, as we were told, are for the Club Men to stand and fight upon in time of Battle, for the large Canoes, from what I could learn, are built most, if not wholly, for war, and their method of fighting is to Graple one another and fight it out with Clubs, spears, and stones.

CONSTRUCTION AND MANUFACTURE

Fire was used to aid in felling large trees; but even so the labor was long and arduous, for it was no small undertaking to fell and trim a large hardwood tree with stone implements. The tree was trimmed in the upland where it stood, then dragged down into the valley below, where the main parts of the hull were roughed out. A tree cut in the lowlands was roughed out where it fell, then hauled to the house of the owner, by or near the seashore, to be finished.

Plates XIII and XIV show various stages in the roughing out of a *va'a* as the work proceeds. After the tree is down and the limbs are off, the first step is to cut off a log of the required length. This is then trimmed down sufficiently to lighten it and make it easy to drag to a suitable place for work by means of a rope attached to the knob left on one end (Pl. XIV, *A*). After the log has been trimmed down to the right size, the outline of the top sides of the canoe body is drawn on it with charcoal and the body is roughed out. It is said (31, p. 398) that fire used to be used to burn out some of the inside wood as the canoe was hollowed. Axes and adzes complete the excavation of the small modern canoe hulls built nowadays. After a hull has been roughly excavated, it is kept filled with fresh water for some time, to season the wood; or else the whole piece is submerged and left in a stream or pool for some days until the wood has exuded its juices and become water-logged. Then the hull is allowed to dry, after which the work of excavating the inside and shaping the outside proceeds. Plate XIII shows a canoe body nearing completion, and Plate XIII, *B* the sticks that are put inside the body after the sides have been thinned to prevent them from warping. The shaping and seasoning of the keels of large canoes—some of which required several sections of timber to make the required length—was done in the same way as has just been described.

The hewing, out of a log, of the planks used for the side boards in the old days is described by Banks (1, pp. 156-57).

> If it is to be made into boards they put wedges into it, and drive them with such dexterity (as they have told me, for I never saw it) that they divide it into slabs of three or four inches in thickness, seldom meeting with an accident if the tree is good. These slabs they very soon dubb down with their axes to any given thinness, and in this

work they certainly excel; indeed, their tools are better adapted for this than for any other labour. I have seen them dubb off the first rough coat of a plank at least as fast as one of our carpenters could have done it; and in hollowing, where they are able to raise large slabs of the wood, they certainly work more quickly, owing to the weight of their tools. Those who are masters of this business will take off a surprisingly thin coat from a whole plank without missing a stroke. They can also work upon wood of any shape as well as upon a flat piece, for in making a canoe every piece, bulging or flat, is properly shaped at once, as they never bend a plank; all the bulging pieces must be shaped by hand, and this is done entirely with axes.

According to Wallis (29, p. 487) one end of the log to be split into planks was heated till it cracked, then wedges of hard wood were driven in to split off slabs to be hewn into boards. Planks 2 feet wide and 15 to 20 feet long, were taken off in this way. They were trimmed down to a thickness of 1 inch with small adzes, six or eight men working together on one plank. Other writers say that planks used for side boards on the old canoes were 1.5 or 2 inches thick.

The hull or keel side boards were cut to fit with precision. Figure 11, *b* shows the joining seen on a canoe in Raiatea. Ellis wrote (10, vol. 1, p. 156): "The joints or seams were not grooved together, but the edge of one simply laid on that of the other, and fitted with remarkable exactness by the adze of the workman, guided only by his eye: they never used line or rule."

Wilson (31 pp. 398-9) gives the best description of the old method of caulking seams:

> They prepare their pitch for paying the seams, by wrapping the gum of the bread-fruit tree round candlenuts stuck on skewers of cocoa-nut leaf ribs: these being lighted, the pitch drops into a tray of water, and squeezing out the aqueous particles, they spread it on the plank edge, and lay the cocoa-nut husk beaten fine over it; then smear it with pitch, and fit on the next plank, pressing it powerfully with ropes and levers, and securing it into place with lashings.

The parts of the canoe were sewed together by means of sennit passing in and out of holes bored through the margins of the pieces. Tyerman and Bennett (26, vol. 1, pp. 72-3) describe a man and his wife sewing a canoe together. It was evidently customary for a woman to help her husband in this labor, for in the legend of Hiro it was while she was helping him to lash his canoe that Hiro caught his wife's hand in a loop of sennit, dragged her out to sea, and drowned her.

> Holes are bored, two and two, about an inch apart, with two feet distance between each two; these, in the pieces to be fastened together, being lashed opposite each other, and wide enough to allow the cinet to be drawn three or four times through. The couple whom we saw at work proceeded very deliberately; when the cinet was passed through a hole, it was pulled tight by means of a short stick, whereby a strong purchase was obtained; and while this was employed on one side, a stone was used on the other to beat the cord flat, that it might lie close. A peg was then driven into the hole, to keep it from slackening, till another stitch had been taken; and the work was secured after the last stitch in the same way by a pin, that filled up the hole, and wedged the end fast.

Forster (12, p. 461) describes a man he saw using a forked stick for drawing taut the lashings of a canoe.

> Their mechanical genius I particularly admired, having an opportunity of seeing one day a man busy in sewing a large canoe together: he employed a stick with a forked branch for the purpose of drawing the string more powerfully together; one of these branches he fixed against the lowermost plank, and to the other he had fastened the string or rope, which gave him an amazing purchase, and as soon as the string or rope was stretched to its utmost, an assistant struck a peg into the hole through which the string passed, to prevent its giving way again.

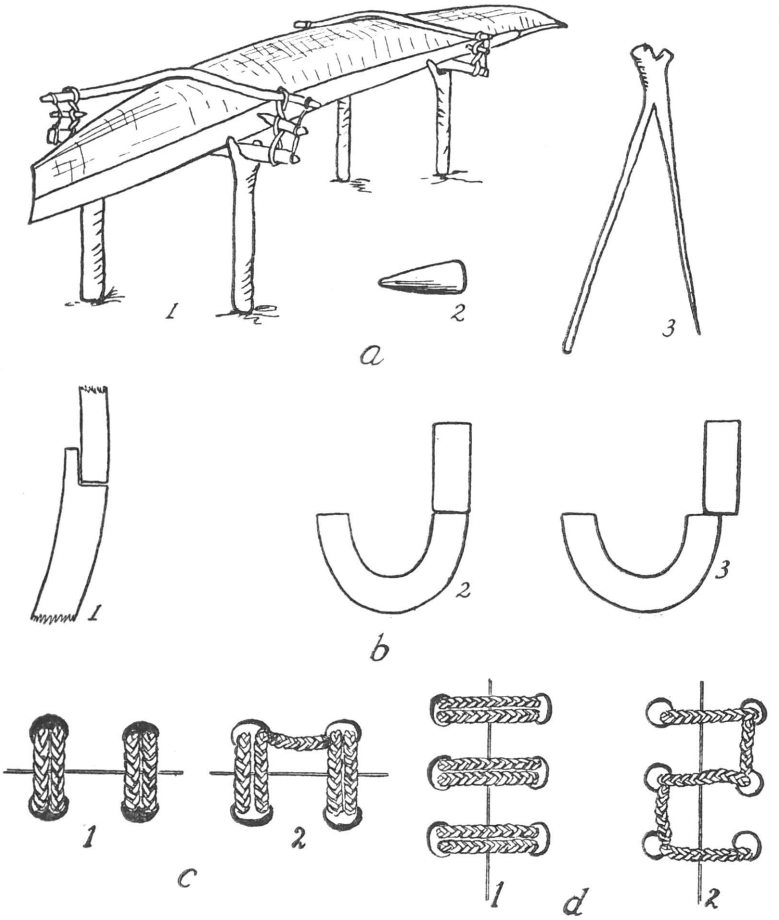


FIGURE 11.—Canoe features: *a*, vice and lashing implements, Huahine: 1, vice; 2, plug with which to drive material into lashing holes to caulk them; 3, device for pulling lashings taut (height 2 feet) (from sketches by K. P. Emory); *b*, joining of built-up Raiatean canoe: 1, sideboard to bow; 2, sideboard to hull, amidships; 3, sideboard to hull, near bow; *c*, sennit canoe lashings, horizontal seam: 1, appearance on outside of hull; 2, appearance on inside of hull; *d*, sennit canoe lashings, vertical seam: 1, appearance on outside of hull; 2, appearance on inside of hull.

Figure 11, *a*, 3 is drawn from a rough sketch made by Emory of such an instrument used in lashing now on Huahine. Here Emory also had opportunity to observe a vice for holding a hull in process of sewing and caulking (fig. 11, *a*, 1). Green *purau* bark is wrapped around the upper and lower rods of the vice, and a stick is inserted to make it taut.

The lashing is not continuous, but is applied at intervals along the seams. Figure 11, *d* shows both the inside and the outside of the hull of a built-up canoe which I observed on Borabora. The pairs of holes were mostly in twos, sometimes in threes.

The labor of assembling a large built-up boat in the old days was by no means a simple matter. This part of the work is described as follows by Banks (1, p. 161).

> The *pahies,* as they are much better embarkations, so they are built in a more ingenius manner. Like the others they are laid upon a long keel, which, however, is not more than four or five inches deep. Upon this they raise two ranges of planks, each of which is about eighteen inches high, and about four or five feet in length: such a number of pieces must necessarily be framed and fitted together before they are sewed; and this they do very dexterously, supporting the keel by ropes made fast to the top of the house under which they work, and each plank by a stanchion; so that the canoe is completely put together before any one part is fastened to the next, and in this manner it is supported till the sewing is completed.

Except in the matter of the tools employed, the hewing of parts, assembling, caulking, and sewing of composite modern canoes is done just as it used to be. As I have had no opportunity to observe the assembling of a built-up *va'a,* I can add no details to those already given or quoted.

The outrigger of a modern canoe consists of a light float made out of a very slightly-bowed *purau* log, pointed at either end, and supported by two rods. The forward support carries the whole strain of the outrigger, while the after rod is just a flexible attachment holding the float in line. The forward bar is therefore a stout spar made of some strong wood, such as *tamanu,* cut roughly square, arched slightly upward between the canoe body and the float attachment, and turned up gently at either end. To this bar the float is attached by four stiff rods of durable orange or guava wood (Pl. XIX, *A*), which give rigidity; and by sennit cords or wires passing through the float or attached to pegs inserted in it (Pl. XV, *B*). The cords or wires rising to the supporting rod from their point of attachment on the float are lashed to the rod just by, or just beyond, the point of attachment of the small rod (Pl. XVI, *B*).

The arrangement of the after rod is much simpler. The rod consists of a light flexible pole, preferably of orange wood. It is sometimes slightly, sometimes deeply, bowed. The rod is generally chosen because it has a natural bowed form which it will retain; but sometimes a cord running from side to side of the arc of the bow to keep it bowed. This rod runs directly to

the float, to which it is attached by being lashed to a small peg driven in the upper side.

The lashings are put on in the following way: Below the points at which the forward supporting rod crosses the gunwales of the hull there are two holes. Starting on the side away from the float (on the port side of the canoe), the sennit cord is passed alternately through one hole, up over the rod and down through the other hole, then up the rod and down through the first hole, and so on, until there are two or more lashings over the rod on either side of the gunwale. A peg is sometimes, but not always, driven in the holes to hold the lashings. The sennit cord is then carried along the bar toward the other side underneath the rod on one side. At the mid-point of the rod between the sides the cord is passed twice around the rod, caught with a half hitch and carried on to the other gunwale, where it is lashed over the rod and through the holes in the manner already described. Here the cord usually ends. It is then tied inside underneath the rod and cut off. Sometimes it is carried along the rod to attachment of the small oblique rods on the float. Here the upper ends of the oblique rods are lashed to the supporting rod as shown in Plate XIX, *A*. The wire loops are sometimes held taut by passing this lashing through them several times; or they may be held by separate cords, and the same is true when sennit instead of wire holds the float.

At the hull the after supporting rod is attached as is the forward one, except that the sennit needs to be passed around the small rod only half as many times as around the larger one.

ORNAMENTATION

The sides of the native canoes of these islands were never carved, but bows and sterns were ornamented with carvings. Cook (4, p. 98) and Banks (1, p. 158) both describe carved human figures as adorning both bow and stern pieces of the larger canoes. (See Pl. XVII.) Ellis (10, vol. 1, p. 153) describes the decoration he saw on a double canoe: "A rude imitation of the human head, or some other grotesque figure, was carved on the stern of each canoe. The stem, often elevated and curved like the neck of a swan, terminated in the carved figure of a bird's head."

Ellis describes (10, vol. 1, p. 152) the high stern pieces of the ceremonial canoes, sometimes 18 feet tall, as "frequently ornamented with rudely carved hollow cylinders, square pieces, or grotesque figures, called *tii*." Banks says (1, p. 161) that small canoes had "usually a small carved pillar upon the stern." These objects that had the appearance of cylinders, squares, and carved pillars to the voyagers were probably examples of the conventionalized carvings made in the Society and Cook Islands to represent patron deities.

The appearance of the carved sterns is represented in Plates XV, *A* and XVII.

Ellis (10, vol. 2, p. 163) describes other conventional forms of adornment which consisted of streamers of various colored cloths and Forster (12, p. 460), "long garlands of feathers" hanging from the masthead or the peak of the sail. Banks (1, p. 161) says about these feather ornaments: "On the top of this sail they carry an ornament which, in taste, resembles much our pennants; it is made of feathers, and reaches down to the very water, so that when blown out by the wind it makes no inconsiderable show."

Forster (12, p. 460) speaks of canoes having "at the top of the mast . . . a bush of young branches of a tree. . . . " —doubtless *miro* branches, tokens of peace.

MAST AND SAIL

In pre-European days masts and mat sails were used with all kinds of canoes, even the fishing canoes which are now rarely rigged. The masts of all types of craft were movable, being stepped only when needed. They were held in place by stays made of plaited *more* which were attached to a cross spar or balancing plank lashed to the forward outrigger (Pl. XVI), and to bow and stern. The ancient rigging of the mast was apparently just the same as that to be seen today on the sailing canoes in the Leeward Islands. In describing a double *pahi* Ellis (10, vol. 1, p. 170) says, "a kind of ladder, or wooden shroud, extends from the sides to the head of the mast." He also describes the balancing spar of the old canoe as follows (10, vol. 1, p. 161):

> The island canoes [*va'a*] have a strong plank, twelve or fourteen feet long, fastened horizontally across the centre, in an inclined position, one end attached to the outrigger, and the other extending five or six feet over the opposite side, and perhaps elevated four or five feet above the sea. A small railing of rods is fastened along the sides of this plank, and it is designed to assist the navigators in balancing the keel, as a native takes his station on one side or the other, to counteract the inclination which the wind or sea might give to the vessel.

The vessels equipped for deep-sea voyaging were equipped with washboards. To quote Ellis again (10, vol. 1, p. 160):

> Planks, twelve or fifteen inches wide, are fastened along their sides, after the manner of wash-boards in a European boat. The same are also added to double canoes, when employed on long voyages.

This feature is described in Wilson's voyage (31, p. 401) as follows:

> The single canoes, when rigged for sailing, are raised with a washboard of ten or twelve inches above the gunwale; and on top of this, opposite the outrigger, is a stage about two feet wide, and running about ten or twelve feet along the side of the canoe: this is made of planks well lashed to the spars which support them, and to this they bring the shrouds.

Double canoes were rigged for sailing as though they were two single canoes, with a mast in each hull.

The sails (*ie*) used to be made of *Pandanus* matting held in a frame (fig. 12 *a*). These sails were peculiar in shape. The accuracy of details in figure 12, *a* is attested by the fact that it agrees entirely with another drawing of a native canoe made by a British officer a few years later. (See Pl. XV, *A*).

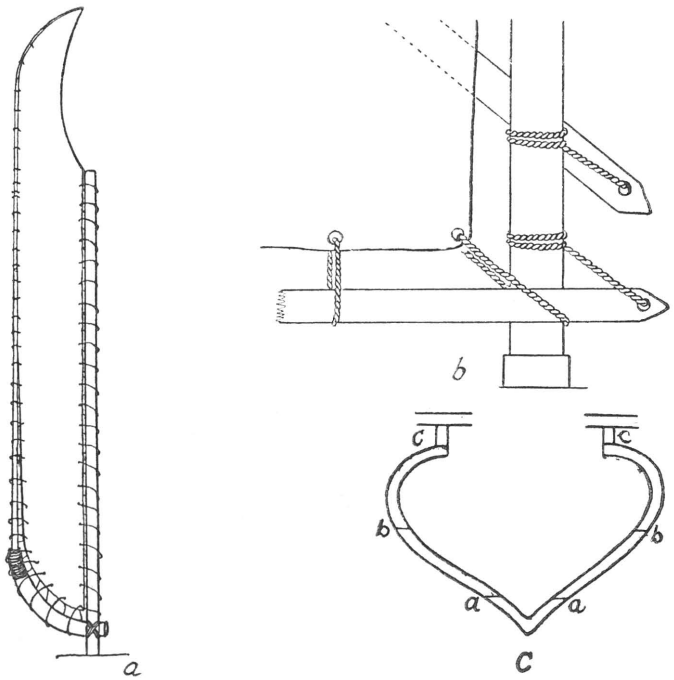


FIGURE 12.—Sailing canoe rigging: *a*, old form of Tahitian mat sail (from a drawing by Webber, published by Tyerman and Bennet in their "Journal of voyages and travels"); *b*, attachment to mast of boom and sprit of modern Leeward Island's sailing canoe; *c*, cross section of *pahi*.

Ellis (10, vol. 1, p. 162) speaks of "other sails . . . commonly used in the same manner as sprit or lugger sails . . . used in European boats." The sprit sail made of canvas is the form universally used at the present time on the large sailing canoes in the Leeward Islands.

Ropes were attached to the corners of the sails, and they were held in the hand rather than belayed.

The modern sailing canoe is rigged with a spritsail (Pl. XVI). The mast is stepped through a hole in a crosspiece that is nailed on a gunwale just forward of the outrigger support. Some canoes have two shrouds on either

side, others only one. These are attached to the outrigger and the balancing sprit. A stay runs forward and is attached through a hole in the bow. The stays and shrouds are generally made of three- or four-ply plaited *more* rope, though sometimes of commercial manila. The shrouds and forward stay are attached a few feet below the masthead; below them, holding them up where they pass around the mast, are two pegs, that pass through the holes in the mast, at right angles to each other. The forestay is attached above the pegs by a spliced loop which is simply passed over the top of the mainmast. The outrigger and balancing sprit of the modern sailing canoe are exactly as they used to be. The balancing sprit is lashed to the upturned end of the forward outrigger support. Occasionally there is a small bowsprit; but I have never seen a jib used on a sailing canoe.

The sail itself is in the main supported by an oblique sprit from the lower corner of the mast to the afterpeak. It is held to the mast by loose ropes instead of rings, and is lashed to a light boom at the bottom. At the peak it is held up by a rope that passes through a hole in the mast and down the mast, to be belayed to the bow of the canoe, thus serving as the forestay. The lower corner of the sail is lashed directly to the mast. The attachment of the boom ends and the sail sprit is shown in figure 12, *b*. Two-thirds of its length away from the mast the boom is held by a sheet rope, which is sometimes attached directly to the boom, or else passes through a long rope or pulley. This sheet rope is belayed to the after outrigger.

Over the stern there extends a long sprit that is sometimes nearly as long as the canoe itself, if it is a small canoe with a large sail. The inner end of this is lashed either to the stern outrigger where it crosses the hull, or to a separate crosspiece nailed or lashed nearer the stern. Near the outer end of the sprit is lashed a pulley or loop of rope through which passes a rope that is attached to the after peak of the sail. This controls the extension of the upper edge of the sail. It is fastened at the lower end to the after outrigger. The running ropes are generally commercial manila, though occasionally the plaited *more* is seen.

EQUIPMENT

For seats in the smaller canoes a small board resting on the gunwales sufficed. In larger canoes the seats rest on cleats nailed in or on bosses left on the inside of the hull when it is hollowed. Occasionally small depressions are cut in the top of the hull before the gunwale is put on, and the seats are fitted into these.

In the days of the old order, fishing, voyaging, and fighting canoes used to be equipped with small thatched cabins, but nothing of this kind is now done. Forster wrote (12, pp. 459-60): "Boats used for long voyages have on their foreparts small huts covered with thatch and defended on one or two

sides either with boards, or a partition of bamboos, and lined besides with mats, here the chief people sit by day, and sleep by night."

Banks (1, p. 159) describes seeing a double canoe with "a small neat house five or six feet broad by seven or eight feet long fastened upon the forepart."

When intended for the use of a chief, these little deck houses or cabins (*fare oa*) were made so that they could be taken ashore for his accommodation when he stopped for the night in travelling. These removable deck houses are mentioned by the early Spanish missionaries (7, vol. 1, p. 358; vol. 2, p. 82.)

Sometimes instead of the cabin there was at bow, stern, or amidships, an awning of *niau* mats supported on four posts and a frame. In recent times it has been the custom to decorate such awnings, when made for festive regattas, with fringes of *more*.

Paddles (*hoe*) were, and are, made of *purau, mara* (*Nuclea forsteri*), or *mape* (*Inocarpus edulis*). The paddle is simple in form, with a gentle flare and rounded lower end. The paddles actually used were probably never carved. The steering paddles (*hoe fa'a-tere*) used in handling the large, ancient canoes, must have been very large, judging from those that have been utilized in Fiji for the same purpose in more recent times. Plate XIX, *B* shows a steering paddle such as is now used in steering and sailing canoes in the Leeward Islands. They are from 6 to 8 feet in length, and are best when made of the hard wood of the *mara* tree. The blade-like roots of the *mape* tree make very handy material out of which to carve the large paddle.

Stone anchors (*tutau*) were once used. Now a stone or piece of pig iron (Pl. XIX, *C*), or sometimes a small iron anchor is used by fishermen.

Bailing was an important part of seafaring in the old days. Bailers were termed *totaa* or *hauahau* (Maupiti). Plate XIX, *C* shows an old bailer, 15 inches long, 5 inches deep, and 7 inches in diameter, seen on Maupiti.

RAFTS

Figure 13, *b, c* shows a raft (*reho*) made of bamboos that was observed in use for carrying chunks of coral in Raiatea. The body of the raft (fig. 13, *b, c,* 5) consisted of a bundle of long bamboos, tied together at the front to make a roughly pointed bow. At the points marked "1" in the figure lashings of *purau* bark pass around the bundle. At the stern there was a pole (fig. 13, *b, c,* 4) across the upper side of the bamboos, to which bamboo is lashed with *purau* bark. Just forward of this was a platform which was held some inches above the surface of the water. This consisted of a deck (fig. 13, *b, c,* 3) made of purau poles resting on three crosspieces (fig. 13, *b, c,* 6) which were lashed to the bamboos below. The poles forming the

deck were held in place by three cross pieces (fig. 13 *b, c,* 2) laid on top, each being lashed to the supporting cross piece below it.

In the shallow water of the lagoon this raft was pushed by men wading in the water, or poled by men on the platform and poled. Perhaps more interesting than the use in these islands of the raft itself is the fact that kites were formerly used to propel them. There is a well-known story of a time when the district of Vairao in Tahiti, having a debt of revenge to pay Vaiari

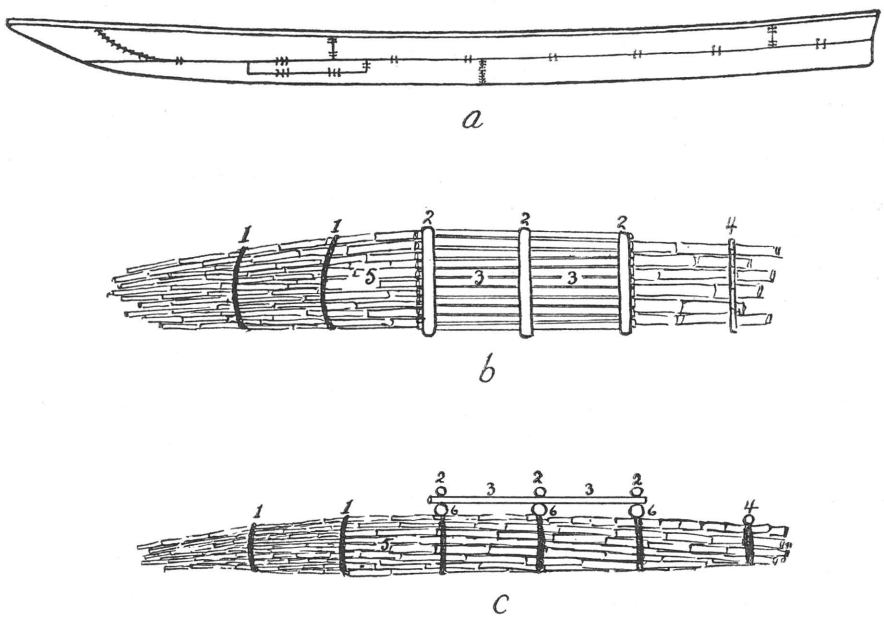


FIGURE 13.—Leeward Islands canoe and raft: *a,* patchwork hull of Raiatean sailing canoe; *b, c,* top and side view of bamboo raft: 1, lashings of *purau* bark; 2, crosspieces; 3, poles used for decking; 4, binding pole at stern; 5, bundle of long bamboos constituting body of raft; 6, crosspieces supporting deck .

(now Papeari), which lies to the northwest across a broad bay, loaded rafts with food and sent them across the bay by means of kites; this was ostensibly a freewill gift, but in reality intended to lead the Papeari people to return the compliment by coming unarmed to Vairai with a return gift. The ruse succeeded and the people of Vairai had their revenge. Concerning the use of rafts in this bay in ancient times, Corney writes (7, vol. 1, p. 324): "Kites have been used for towing rafts of timber and bamboos at this part of the coast—Mataiea and Papeari."

LABOR

The canoe-building craft in the old days was in the hands of a class of highly respected and well-to-do professional builders (*tahu'a tarai va'a*) who constituted a sort of guild having its own regulations, rites, and places of worship. The chiefs had *tahu'a* attached to their establishments, and there were other artizans who worked for hire. All would be drafted for service when the larger canoes or ships were built for the chief of the district. According to Henry (15) there were two classes of *tahu'a;* the *tahu'a tarai va'a* who worked for the public, and those called Ati-tu "who built sacred canoes upon special marae grounds. . . ." It is my belief that Ati-tu was merely a term that was applied to *tahu'a* when they were engaged in the consecrated labor of building a canoe dedicated to the gods, the chief, or war. In the Marquesas the warriors and priests of a tribe were called Ati-Tu while they were taking part in the war ceremonials, but those participating constituted a distinct class only during the war tapu. My inference is that Ati-tu designated in Tahiti the *tahu'a tarai va'a* and their assistants when acting as a consecrated body, during the time of their labor on a sacred vessel.

When at work on a job, either for the chief or for another employer, the skilled craftsmen were assisted by apprentices, by members of the family, and by such *manahune* as were attached to the family. The building of the large boats was a community affair. In the account of the voyage of the *Duff* (31, p. 399) it is written that: "The war canoes, and those sacred to the Eatooa, are built by a general levy: the chief issues his orders to the towhas [artisans], they to the ratirras [landowners], who call upon their tenants, the manahoune, for hogs, cloth, oil, etc. to support the carpenters who are sent to the work."

Following the usual Polynesian custom the workers were supported by their employer, a private landowner, or the chief, during the work. As is usual throughout Polynesia, the *tahu'a* received payment in two ways: in feasting and in gifts. Numerous feasts marked different stages in the progress of the labor of making a new boat. The *tahu'a* were also remunerated by their employer with compensatory gifts of hogs, cloth, mats, and the like.

CEREMONIALS

The making of a large vessel, such as a war canoe or a chief's travelling boat, was associated with a ceremonial of the usual Polynesian type. Tane (known also as Tane-i-te-haa) was chief patron of canoe making, though others of the greater gods were also appealed to in the chants used. The shed in which the work was done was consecrated, as were also the workmen, who remained in a state of tapu, during the whole period of the labor, remaining in seclusion at their place of work, and having special food prepared for

them. The purpose of all this was to prevent evil psychic influences of any kind from entering into or contaminating the boat.

To begin work with the coming of the new moon was evidently thought to be propitious, for the preliminary ceremonies commenced on "the evening of the last night of the moon." That evening each *tahu'a* took his adze and put it "to sleep" (*ha'a moe ra'a i te to'i*) in a recess in the marae. A chant, descriptive of the preparation of sharpening, and lashing the adze was recited; after which there was a ceremonial feast. During the cooking of the hog, handfuls of its hair were offered to Tane "so that the eyes might be alive for the work, and the adzes run" (*ei mata ora te ha'a, ei to'i horo*). The tail of the hog was offered to Tane, and red feathers to the other gods of the temple. At dawn the next morning each man took his adze from the marae, carried it to the seashore, and there intoned another chant to "awaken" the adzes, and the gods Tane, Taere [keel], Te-fatu [probably Te-fatu-mouna, lord of ocean], and Taaroa. The artizans then girt themselves with their "working malo" and went to cut the timbers and bring them to their shed. Throughout the work all signs and omens were carefully observed.

When the hull was ready to be drawn to the beach, a special chant was intoned as the rollers (*ra'o*), which were sections of coconut logs, were laid in place as the hull proceeded on its way. This chanting was continued all the way to the shore. It assigned the rollers to different ones of the major gods who were asked to help in the moving. After the final finishing and fitting came the launching formalities.

A very good account is given by Henry (15) of the ceremonial practices attendant upon canoe building:

> The day before launching, the canoe was drawn out of the shed onto the rollers and there propped up and rigged and decorated with pennants and garlands; and close by it the builders gave a feast at which great hogs were baked whole. They invited as guests men of the same profession as themselves, to whom they made liberal presents of baked pigs and cloth to take home. In the evening, the hatchets were again "put to sleep" in the marae for the night. A piece of sennit about a foot long was taken and passed under the foremost end of the outrigger of the canoe and laid down to sleep also; it was placed flat upon the marae ground beneath a flagstone to obtain an augury from the gods. Early in the morning, the axe was "awakened" as before, and the flagstone was carefully lifted off the piece of sennit, which the artizans examined with great interest. If it was quite straight it indicated that the canoe had fine prospects before it, if tortuous, the canoe would be beset with dangers, but escape safely, and if the sennit had become twisted or turned over, the canoe would be in danger of being lost at sea. Then to ensure safety for the canoe at all hazards, a piece of the hull of an old marae canoe was "put to sleep" in the marae, there to remain untouched as long as the canoe lasted.

When all was ready for launching, the chief or his representatives put his hand on the side of the boat and gave the command, "A to! A to! A to!"

(Draw! Draw! Draw!). As the bows were dipped, which was referred to as "making the canoe drink," the chief artizan recited a chant to Tane to make the craft seaworthy.

A war canoe was given a trial run by the *tahu'a* and priests, all chanting as they paddled. The run ended in the passage abreast of the harbor, where the crew suspended their paddles.

> The high priest broke open an *opa'a* (matured coconut) and carefully sank the two halves in the sea with the hollow side turned upwards. If they went down steadily, maintaining their position, it indicated that the land would be prosperous under long peace. If one half turned over in going down, it foretold war in the indefinite future. If both halves turned over, immanent war was anticipated. Then they returned to the shore and drew the canoe up on to the place allotted to war canoes, apart from all others.

Feasting constituted an important element in the socio-religious ceremonial associated with the building of canoes. Miss Henry's account mentions feasts at the beginning and at the completion of the work, but these were not the only feasts by any means. From the account of the *Duff's* voyage (31, p. 399) the following is quoted:

> When the timbers are collected, they are laid under the shed where the canoe is to be built: a feast is then made to engage the favorable assistance of the Eatooa; and being very acceptable to the workmen, they hold one before the tree is cut down, another at the commencement of the building, and on making fast every course. When the first strake or bottom is completed, there is a great entertainment and offering, and so on till the whole is finished, when the festivity is greatest, and the canoe for the Eatooa dressed out with cloth, breastplates, and red feathers, and a human victim is offered. The offerings for the war canoes are only hogs, &c. . . .

When a new *pahi* was made for the chief at Maupiti there was a general tapu (*rahui*) laid on hogs in preparation for the coming festivities. When the boat was finished, a man was killed and eaten by the priest of the chief's temple, at the place where the canoe was made. This was to consecrate (*amoa*) the *pahi*. As the boat was launched name songs (*ute*) were sung and there was great festivity. The *rahui* was removed, and there was a great feast on the gifts of hogs and other food brought by the population as offerings to the chief. The singing of *ute* at the time of launching was also customary in Tahiti. (10, vol. 2, p. 240.)

USES

The large sailing vessels were in the charge of a master mariner who was called the *faatere* (steerer). The paddlers were called *rao*, or *rao taata*—which signifies a floor beam in ordinary usage—probably because it was the duty of these men, when the vessel was carrying a sacred personage, to leap into the water as the boat approached the shore and carry it on land on their shoulders.

Ellis (10) describes the crew of a double canoe in which he was travelling as follows:

> The steersman stands or sits in the stern, with a large paddle; the rowers sit in each canoe two or three feet apart; the leader sits next; the steersman gives the signal to start, by striking his paddle violently against the side of the canoe; every paddle is then put in and taken out with every stroke at the same moment; and after they have thus continued on one side for five or six minutes, the leader strikes his paddle, and the rowers instantly and simultaneously turn to the other side, and thus alternately working on each side of the canoe, they advance at a considerable rate.

The uses of the different types and sizes of canoes were various. The smaller craft, such as those that are still made everywhere, were intended primarily for fishing, though they served also as auxiliaries in war. Small double canoes were employed for deep-sea fishing, and for short voyages between islands or along the coast. The only double canoes that are used now are those lashed together temporarily to make the *tira* used in the bonito and tuna fishery. In the old days the large double *vaa* and *pahi* were used as royal barges, for floating maraes, war, and travelling boats.

The *va'a ti'i* (image boats) were floating marae. Cook saw several of these, which he describes as follows (5, vol. 1, pp. 342-3):

> There were attending on this fleet some small double canoes, which they called *Marais*, having on their fore-part a kind of double bed-place laid over with green leaves, each just sufficient to hold one man. These they told us, were to lay their dead [probably sacrifices] upon; their chiefs, I suppose they meant, otherwise their slain must be few.

Ellis (10, vol. 1, p. 154) describes these ceremonial canoes as being "always strong and large, more highly ornamented with carving and feathers than any of the others. Small houses were erected in each, and the image of the god, sometimes in the shape of a large bird, at other times resembling a hollow cylinder, ornamented with various coloured feathers, were kept in these houses. Here their prayers were preferred, and their sacrifices offered."

The form of the war canoe has already been described. The powerful chiefs possessed fleets of these of considerable size. Naval reviews or regattas in which the war craft, floating maraes, and small canoes all took part, decorated in full regalia, were typical of Tahiti in the old days of chiefly pomp. In one such review Cook (5, vol. 1, p. 326) saw "one hundred and sixty large double canoes, very well equipped, manned, and armed." Wallis (29, p. 486) mentions simpler displays in which fewer canoes took part. Describing craft that seemed to be "intended principally for pleasure and show," he wrote:

> They are very large, but have no sail, and in shape resemble the gondolas of Venice: the middle is covered with a large awning, and some of the people sit upon it, some under it. None of these vessels came near the ship, except on the first and second day after our arrival; but we saw, three or four times a week, a procession of

eight or ten passing at a distance, with streamers flying, and a great number of small canoes attending them, while many hundreds of people ran abreast of them along the shore. They generally rowed to the outward point of a reef which lay about four miles to the westward of us, where they stayed about an hour, and then returned. These processions, however, are never made but in fine weather, and all the people on board are dressed; though in the other canoes they have only a piece of cloth wrapped round their middle. Those who rowed and steered were dressed in white; those who sat upon the awning and under it in white and red, and two men who were mounted on the prow of each vessel, were dressed in red only.

For travelling both the single sailing canoe and the double canoe with two sails were used. While the former was the most seaworthy in heavy weather, being less apt to break up and swamp, those made by lashing together two hulls and building a deck and cabin on top seem to have been most used for such long voyages as those to the Tuamotus and Austral Islands. They could carry more passengers, and supplies or freight.

There was extensive voyaging for purposes of trade, both within the group and beyond its limits. Food pounders and stone for making them were brought down to Tahiti from Maupiti, adzes from Raivavae (12, p. 522), and red feathers from Rarotonga and the Tuamotu Islands (17). The account of the voyage of the ship *Duff* describes regular trade between Tahiti and adjacent islands. It is said that about 40 sailing canoes were engaged in carrying provisions from northern Tahiti to Tetuaroa, and bringing back fish, coconut oil, and the food called *taiero*. There were also regular trading voyages between Tautira and the island of Mehetia, whence were brought pearls and pearl shells, and carved wooden dishes and stools (31, pp. 402-3). Throughout the Leeward Islands there was the most active intercourse, extending from Raiatea and Huahine to Maupiti, and also eastward to the Tuamotu Islands, as well as southward to Maiao, Tahiti, Moorea, and beyond. My impression is that the chiefs of the Leeward Islands were much more active traders, voyagers, and explorers than those of Tahiti. Tradition bears this out, since both Hiro and Turi appear to have belonged to this section, the former to Tahaa, and the latter to Raiatea. And history points to Raiatea as the center of the dynasty of seafaring chiefs who spread their domain throughout the Society Islands and beyond, to the Cook and Austral Islands, and the Tuamotus.

Within the group there was probably more travelling from island to island for social purposes than for any other, for there were continually circulating groups of *arioi,* and religious and social festivities at which the whole neighboring population gathered, bringing offerings, gifts and supplies, and the people, from the chiefs down, appear to have spent a great deal of time in visiting and exchanging courtesies.

Exploration and adventure were the motives that led the old mariner chiefs of these islands to make the long deep-sea voyages that were undoubted-

ly responsible for the spread of the Polynesian culture to every corner of the South Pacific. The Polynesian traditions—notably those relating to Moikeha, Hiro, and Turi—prove that voyages were made from the Society Islands to the very limits of Polynesia: to Hawaii, Rapa, and New Zealand. Lists of islands known to the natives of Tahiti at the time of discovery, compiled by early voyagers (12, pp. 513-28; 7, vol. 2, pp. 187-94) mention islands in the Tuamotuan archipelago, Austral and Cook Islands, Rotuma, "Heavai"—possibly Hawaii, described by Tupai as the "father of all the islands" (12, p. 524—New Zealand, and many other unidentifiable names, among which are undoubtedly included Samoa, Tonga, and Fiji.

Henry (15, p. 464) preserves in the following chant that which was entitled the "Tahitian Circuit of Navigation."

> After Ru and Hina had located lands, Maui and his flotilla sailed again over the ocean, for his king [arii], Ama-tai-atea (Outrigger-of-the-expansive-ocean). As he and his people arrived at lands, they built temples conveniently and assigned them to priests.
>
> They went to the borders [i na hiti]. They went to the east [i hiti'a], to the Tuamotus and to Mangareva. They went south [na to'a], to Tupuai, to Rurutu, to Fenua-ura (Paroquet Islands, the Australs, famous for red feathers), Rimatara, and to Te-ao-tea-roa (The-long-white-land) of the Maoris. They went everywhere in these directions. They went west, to Tutuila, Upolu, Savai'i (Samoa); and to Vavau, Atiu, Ahuahu, and Ma'atea (or Makatea, formerly called Papatea). They went north (*na to'erau*) to distant Nu-uhiva (Marquesas), and to burning 'Aihi (Hawaii).

So much for the region that was definitely known prior to European contact, which includes the whole of Polynesia, except Easter Island. It is likely that some explorers and their crews reached land far beyond these limits; some to remain there, others to attempt unsuccessfully to return, and a few to complete the home voyage. In considering the size of boats and the maritime activity of these skilled and fearless natives of the sea during a period of over 1000 years, their endurance and intelligence, and the countless legends of voyages, it seems probable that Polynesians have strayed not only into Melanesia, Micronesia, and Malaysia, but even to the shores of America.

In sailing, the masts of these native vessels in these islands remained permanently stepped in the bows, in contrast to the custom of shifting the mast to meet the wind, which was typical of Fijian sailing. The balancing plank and heavy outrigger bar, on either of which a man might perch to balance a single canoe, made the native sailing vessels capable of taking the wind on either quarter. In the old days the *pahi* of the Leeward Islands must have been superior to the Tahitian *va'a* in the matter of sailing qualities, for it had a keel. In sailing the modern *pahi,* one man handles the steering paddle and the sheet rope, while a second is needed in the boat for balancing. (See Pl. XVI, *A.*) The boat is capable of sustaining a

heavier wind with the sail carried on the same side as the outrigger. Sailing Master Varela, of the Spanish ship *Jupiter,* expressed himself as follows with regard to the native sailing (7, vol. 2, p. 282):

> Among the things I admired most were the canoes they used for the fishery and for journeying from island to island, even when long distances apart. It would give the most skilful builder a shock to see craft having no more breadth of beam than three spans carrying a spread of sail so large as to befit one of ours with a beam of eight or ten spans, and which, though without means of lowering or furling the sail, make sport of the winds and the waves during a gale . . .

Temariotuu was the god of navigators (10, vol. 1, p. 163). Nothing is known concerning any mechanical aids to navigation on the long voyages: it appears all to have been a matter of keen sense and observation based on extensive knowledge of the habits of winds, sea, and sky. Modern native skippers in these waters certainly depend as much on instinct and sensory impressions as they do on the compass and dead reckoning, usually more than on calculations of latitude with the aid of the sextant, and certainly more than they do on calculations of longitude, for the chronometer is often absent, or if present, not running, or if running, not regulated. Besides the sun, moon, and stars, they watch such signs as the appearance of the sky—for instance, the atoll of Anaa can be recognized at a great distance by a greenish glow in the sky, caused by the reflection of the sunlight on the bottom of the lagoon—cloud masses, of the regular east and west swell, the direction and nature of the wind, and the flight of birds. It is my personal belief that the native sailors detect land far to the windward by scent. Their knowledge of the meaning of sights, sounds, and smells is very remarkable. The following incident shows how it serves them in approaching a reef at night in heavy weather.

> In 1923 we were crossing from Maupiti to Borabora on the native-built cutter *Teavaroa.* Night fell with ominous cloud masses coming up astern, and Borabora many miles away. With the dark came a heavy blow that carried our small cutter—which had little keel and no centerboard—helter-skelter toward Borabora. The sound of the surf pounding on the reefs was quickly in our ears. Our skipper said he could not bring the boat sufficiently into the wind to make the upper pass leading into the Vaitape bay, but that he would try for the lower pass. I could see nothing but a faint white blur ahead, and wondered how any man could tell one part of the reef from another under the circumstances. But sure enough, after anxious minutes, during which we were skudding and caroming across the foaming white water towards the booming reef, we suddenly saw the lights of Vaitape straight ahead, and emerged from the maelstrom into the comparative calm of the lagoon. Marvelling and grateful, I later asked our skipper how he detected the lower pass, and he replied, "by the sound of the surf."

From a native mariner named Puhoro, Captain Varela, of the *Jupiter* in the Spanish expedition of 1774, obtained the following information concerning the native Tahitian navigation in the old days (7, vol. 2, pp. 284-7).

They have no mariner's compass, but divide the horizon into sixteen parts, taking for the cardinal points those at which the sun rises and sets. Their names, with the corresponding ones in our language, are as follows:

Note by Corney: About half the terms here quoted are recognizable, allowing for differences in the spelling of some. *Maoae, faarua, arueroa, toerau,* are correct; *apiti* is *haapiti, maray* is *maraau, erahenua* is *arafenua,* and *tuauru* may be *uru.* They are names of winds, according to the direction they blow from, and their force. But the directions given in this list do not all quite accord with the names. There are slight variants in the different MSS., but not of moment.

East	E maoae
East-north-east	E apiti
North-east	E tauguaru
Nor'-north-east	E faarua
North	Paofaeti
Nor'-nor'-west	Moehio
Nor'-west	Arueroa
West-nor'-west	Etaparay
West	E toerau
West-sou'-west	E rapatia
Sou'-west	E rayu
Sou'-sou'-west	E tuituipapa
South	Tuamuri
Sou'-south-east	Erahenua
South-east	Maray
East-south-east	Tuauru

When setting out from port the helmsman reckons with the horizon thus partitioned counting from E, or the point where the sun rises; he knows the direction in which his destination bears; he sees, also, whether he has the wind aft, or on one or other beam, or on the quarter, or is close-hauled: he knows, further, whether there is a following sea, a head sea, a beam sea, or if it is on the bow or the quarter. He proceeds out of port with a knowledge of these [conditions], heads his vessel according to his calculation, and aided by the signs the sea and wind afford him, does his best to keep steadily on his course. This task becomes more difficult if the day be cloudy, because of having no mark to count from for dividing out the horizon. Should the night be cloudy as well, they regulate their course by the same signs; and, since the wind is apt to vary in direction more than the swell does, they have their pennants [made] of feathers and palmetto bark, to watch its changes by and trim sail, always taking their cue for a knowledge of the course from the indication the sea affords them. When the night is a clear one they steer by the stars, and this is the easiest navigation for them because, these being many [in number], not only do they note by them the bearings on which the several islands with which they are in touch lie, but also the harbours in them, so that they make straight for the entrance by following the rhumb of the particular star that rises or sets over it; and they hit it off with as much precision as the most expert navigator of civilized nations could achieve.

They distinguish the planets from the fixed stars, by their movements; and give them separate names. To the stars they make use of in going from one island to another, they attach the name of the island, so that the one which serves for sailing from Otahiti to *Oriayatea* has those same names, and the same occurs with those that serve them for making the harbours in those islands.

What took me most in two Indians whom I carried from Otahiti to *Oriayatea* was that every evening or night they told me, or prognosticated, the weather we should experience on the following day, as to wind, calms, rainfall, sunshine, sea, and other points, about which they never turned out to be wrong: a foreknowledge worthy to be

envied, for, in spite of all that our navigators and cosmographers have observed and written anent this subject, they have not mastered this accomplishment.

Figure 14 shows a chart of winds given me by Marau. Forster (12, p. 503) gives some interesting notes concerning the points observed by the native mariners:

> The place where the sun rises they called *Tataheita* [*te hiti o te ra*], and the place where he sets *Topa-t-era* [*topa te ra*]. They likewise found, that the sun from the time of rising came nearer and nearer to the zenith, that he removed farther and farther from that point till his setting, and that at certain times he was perpendicular over their heads; the line whereon the sun comes nearest to their zenith and upon it or the meridian, they call *T-era-whattea* [*te avatea*]. The Northern point of this imaginary line on the horizon, they name *Too-erou* [*toerau*], and the opposite point *Toa.* They have likewise names for several points between these cardinal ones, of which I heard mention, but I was not able exactly to determine either the number or the direction of them. If I am not mistaken, the whole horizon is divided into twelve points, so that two points would fall between two cardinals.

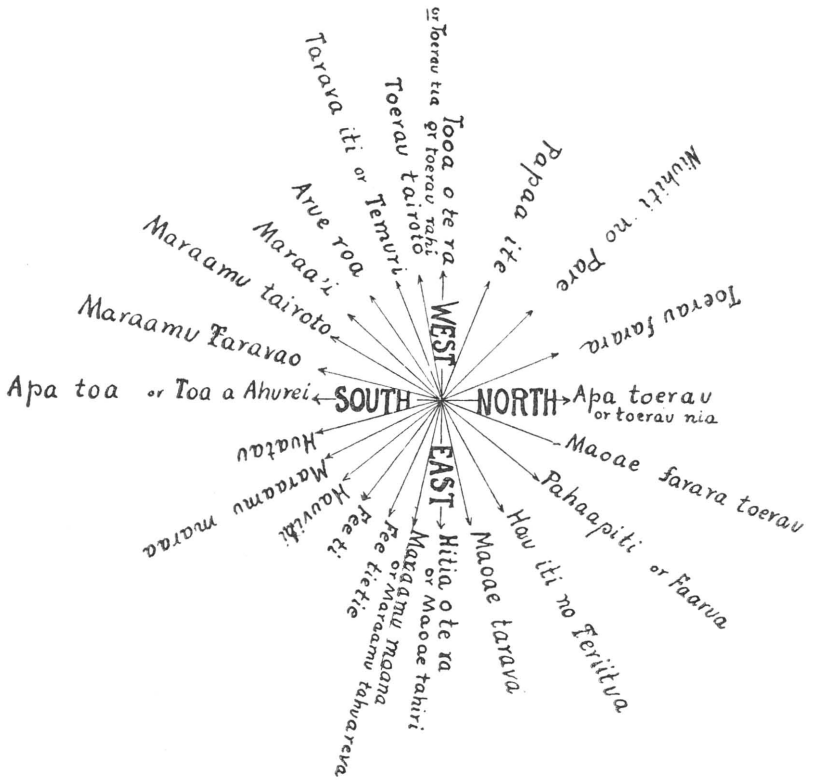


FIGURE 14.—Chart of wind names.

This writer goes on (12, pp. 504-9) to speak of the observation of the seasons, the division of the year into lunar months, and of the month into nights according to the phase of the moon; then continues:

> These divisions of time enable these islanders to observe the heavenly bodies with greater accuracy for their several purposes. They know that the fixed stars do not change their position in regard to one another, and have by long experience discovered which stars rise and set at certain seasons of the year; and by their help they determine the progressive motion of the planets, and the points of the compass during night. *Tupaia* was so well skilled in this, that wherever they came with the ship during the navigation of nearly a year, previous to the arrival of the Endeavor at Batavia, he could always point out the direction in which Taheitee was situated.

FISHING

The existence of the coral reefs, the outer barrier reef and behind it the deep lagoon and the fringing reef along the shore, make the Society Islands as favored a locality for fishing as is to be found anywhere in the world. Native ingenuity, taking advantage of these circumstances, evolved a highly perfected system of fishing knowledge, practice, and apparatus, and a skill and courage in the individual, which justly excited the admiration of many early visitors of these islands.

An adequate account of this interesting subject would require long residence in the islands, to permit the recording of fishing lore, as well as observation and personal experience in many localities throughout the round of the seasons. The account that follows pretends to be nothing more than a compilation from notes made in the course of rapid travels in the Society Islands in 1923, supplemented by information from literary sources.[2] Furthermore, they are notes of an enquirer and recorder who knows little of the science and art of fishing, either in Polynesia or elsewhere.

FISHERMEN

In the Society Islands, fishermen (*fei'a ta i'a*) were not regarded as a distinct professional class. Different localities had their sacred places dedicated to the fishing gods, but these would appear to have been community shrines rather than sanctuaries belonging to a professional class, as in the case of the sacred precincts of Marquesan fishermen. The following quotation seems to indicate, however, that there were individuals in early times, as there are now, who made fishing a commercial means of livelihood. Wilson's Voyage (31, p. 192) speaks of one, "by trade a fisherman, who supplied his neighbors with fish, and received from them canoes, hogs, fruit, roots and cloth." The ownership of coastal property and the fishing rights dependent upon this ownership was restricted to the upper classes—*ra'atira, iatoai,* and *arii*—and these all occupied themselves with fishing during the open seasons. In a sense, therefore, it may be said that fishing was the occupation of a certain section of the population, but this is very different from saying that there existed a professional class of men whose occupation in the community was fishing. In this matter Tahiti, and the Leeward Islands also, show a striking contrast with the Marquesas, where the fishermen were regarded as a distinct social class, and one accorded an inferior position in the social scale. In the Society Islands the *manahune* (the caste of

[2] Since the completion of this paper there has appeared in the Journal of the Polynesian Society an account of offshore fishing in the Society Islands by Mr. Charles Nordoff, a resident of Tahiti. For authorative accounts of albacore and bonito fishing by one who has lived and fished in the Society Islands for some years, the reader is referred to these articles (20).

inferior status) were scarcely allowed to fish at all; those of position and rank were the fishermen. This striking contrast between the Marquesas and Society islands is undoubtedly significant ethnographically.

The fisherman's one essential and typical piece of clothing is now, and was anciently, the malo. Today this consists of a tightly-bound *pareu* which forms a loin cloth. The ends of the long piece of cloth of which the *pareu* consists are brought around so that the margins are in front, and the cloth is rolled to the waist as usual; one of the pendant corners is then drawn up between the legs and fastened by rolling at the back; the other corner is drawn across in front and rolled at the hip.

An article of clothing peculiar to fishermen was the *more* sandal, described by W. C. Handy (14, p. 98-104). These have been observed on Moorea, Tahiti, and Maupiti by our field workers. It is evident from the following remark of Ellis'—who, be it noted, specifies *auti* as the material employed—that they used to be generally used in the islands. Ellis writes (10, vol. 1, pp. 143-4): "When fishing on the reefs, they often wear a kind of sandal made of closely matted cords, of the bark of the native *auti,* or cloth plant. This was designed to preserve their feet from the edges of the shells, the spines of the echinus, etc." Ellis might also have mentioned the poisonous dorsal spines of the *nohu,* which are so much feared on the reef.

The same writer speaks of the use of the fibrous leaf sheath of the coconut tree to make shirts, remarking that this was "a favorite dress with fishermen, and others occupied on the sea" (10, vol. 1, pp. 53-4). This custom was instituted probably in imitation of the dress of European sailors. Had such an article of dress been general in the native times it is certain that it would have been remarked by some of the early voyagers; but none of these mention it. Covering his upper body—unless it be at night when it is chilly—has been, and still is, the last concern of a fisherman. The fibrous leaf sheath of the coconut would certainly have little warmth in it, except such as would be generated by the friction of its exceedingly rough surface on the bare skin!

CEREMONIALS

Henry (15) writes that special maraes were built by "companies of fishermen" and dedicated to the *atua* who were patrons of fishing. In secret repositories in these sacred places were kept the representatives of these deities, sacred relics, and feathers, the symbols of deity.

In his account of his second voyage to Tahiti, the following is found in Captain Bligh's journal (16, p. 113):

> I passed in my walk today a Morai which was called Rooahadoo [Ruahatu], and on it was the piece of cocoanut leaves which is called Tepaou [tapa'au] when presented at a Chief's feet. The Morai consisted of a few stones a few feet square with pieces of plaited cocoanut leaves and tarro placed before it. The altar of offering was a palm

stump with a small stage on which was a cocoanut grater (a piece of coral), some cocoanuts and an empty basket. I found it was erected to ensure success to a ware or dam Tynah has made with stones without Point Venus, in order to catch fish, and I am told that prayers have been performed there by persons of the priesthood.

Henry (15) refers to the "fish gods" as being made both of wood and of stone. Anciently there were doubtless wooden figures carved to represent the superior *atua* of fishing that are later to be mentioned; but all the examples of such talismans that I know of at first-hand were, as in Hawaii and the Marquesas, stones believed to be capable of influencing the fishing primarily through direct magical control. In the Society group these appertained preëminently to the albacore fishery, though there were a few exceptions. The stone figures of this kind were termed *puna aahi*, a phrase that is applied also to the localities frequented by the albacore. The figures may also be referred to by the word *ti'i*, which is the generic term for representations of deity.

At Papara, Tahiti, there was a *puna aahi* with a small marae dedicated to it, both the *tii* and the marae being called Tau-rere. The right of guardianship and control of this *puna* belonged to a single family. The manner in which the guardian controlled the run of *aahi* by means of the *tii* was simplicity itself. When the figure was placed so that it faced the sea, *aahi* would be caught in large numbers; but if its face were turned inland, then no *aahi* would be caught. The first *aahi* caught in every expedition had to be presented at the marae named Tooarai, which is just west of Mahaiatea point. The famous *puna* is probably now buried in or near the site of this temple.

There was another great *puna aahi*, which now likewise lies buried, in the district of Paea. It is related that when commercial fishing was first instituted in Tahiti and Paea men first began fishing for *aahi* to sell in the market in Papeete, the man whose right it would have been under the old order to be keeper of the *puna* went to the place where he knew it to be buried, dug it up, and turned the head of the figure to the mountains, and covered it up again. As a result no fish were caught whatever: not only did the commercialists suffer, but everyone else along the coast controlled by this *puna*. The fisherman of Paea and that part of Papara which is affected were therefore compelled to go and beg the keeper to dig up the figure again and reverse it. This he finally agreed to do, and thereafter the run of fish was normal.

At Pufao, on the northwest coast of Raiatea there was a sacred place described to me as a small stone *paepae*, that was consecrated to a *tii* that controlled the *aahi* fishery along that coast. When the keeper of the *puna* set the figure upright on the *paepae*, the run of fish would be plentiful; but when he turned the figure head down, no fish would be caught. Fishermen

brought part of their haul to the keeper; but it is said that he never ate these offerings himself but left them before the *tii* on the *paepae.*

I was informed on Raiatea by men from Maupiti that there are in use today on that island three stone *puna,* each of which is believed to influence, during the proper season, the run of the particular kind of fish for which it is named. One is named Hopu, and this affects fish of that name; a second, Aahi, affects the albacore; the third is Vau (*va'u*) and this influences the run of the *vau.* I was told that the native pastor of Maupiti was the guardian of these valuable relics of the old order and the dispenser of their blessings. While on Maupiti, however, I failed to secure any information concerning these *tii* or their use, either from my good friend and in most ways most excellent informant Teraitua, the pastor, or from others, beyond the assertion that the *tii* are no longer used and no one knows where they are! This was an instance in which an ill-planned approach, due to working in haste, closed the avenues of approach to an interesting opportunity. I did, however, see the place where the *tii* were (or are) put. This was most interesting, for it is a square coral-lined cist in the ancient *marae arii* of Vaiahu, the bottom of which fills with water at high tide. A *tii* placed in the cist would therefore, be submerged, in part at least, how much depending on its size, when the water was high. This is an interesting point of resemblance in the Marquesas and in Hawaii, where the "fish gods" were submerged when used, their presence in the water evidently being believed to affect the fish dirctly, in a magical way. That submergence was not the rule, however, appears proven by the instances of the Raiatean and Tahitian *puna* already cited. It is interesting to find in the case of the Maupiti *puna* that the *marae arii* was the shrine of the *tii* that controlled the fish. Whether this was the usage in pre-Christian days is unknown. The cist appears to have been an integral part of the ancient *paepae,* but it may formerly have served some other purpose.

Two major deities are described in the Henry manuscript as the patrons of fishing in general to whom the fishermen's temples were dedicated. The first, "Ruahatu-tinirau (Source of fruitful myriads), the Neptune of the sea," Henry (15) identifies with the Rua-hatu-o-te-tai-euea (Source-of-fruitfulness-of-the-thrown-up-ocean), who was responsible for the deluge. It is the second part of the name, however, that is interesting historically, for Tinirau occurs in myth and worship elsewhere in Polynesia. The Tahitian Tinirau (literally, "Innumerable-many" finds its counterpart in Tini-rau, "the tutelary deity of fishes" and "son of Tangaroa, the Lord of Ocean" in New Zealand (25, p. 513). He is also known under the same name in the Cook Islands and the Tuamotus, while in Samoa the name appears as Tingi-lau.

A second major patron of fishing mentioned by Henry is "Tino-rua (Body-of-two-natures), lord of Ocean, the merman who had the tail of a

swordfish." The title occurs in the name of the third night of the new moon as given by Henry (15), Hoata tino-rua. Explaining the phrase "tino-rua," Henry says, "The dark and bright sides of the moon are called two bodies . . . " The inference would appear justified that the name of the deity Tino rua has reference to the appearance of the moon in this phase; and this leads to the suggestion that the moon itself was venerated at some former time as a fishing deity. In these islands where the run of the fish is so obviously influenced by the phase of the moon, of which fact the natives were fully conscious, it would seem almost inevitable that the moon should be associated with the deity venerated as patron of fishing.

Ellis gives several other names as chief patrons of fishing, names that differ from the two already mentioned, referring perhaps to Huahine where he was stationed longest. He writes (10, vol. 1, p. 140) that, "The gods of fishermen were numerous, though Tamai or Tahuura and Teraimateti were the principal."

The first fruits of the fishery were offered to the special patrons by being presented to their shrines (*marae ne te feia tā ia*), or they were offered at the chief's temple (*marae arii*). In October and November came the presentation of the formal offering of the first of the season's catch at the *marae arii.* At this time there reigned the ceremonial tapu on land and sea that marked all occasions of communal rites of major importance. The description by Moerenhout, though applicable to Tahiti as a whole, probably refers specifically to Papara, since it was from the *arii* and *tahu'a* of that district that he seems to have procured the bulk of his information concerning the religion. At Maeva, on Huahine, first fruits of the fishery were presented to Tane, the tutelar lord of the island, at the *marae arii* (Matai rea) at Maeva.

I have interpreted (13) the presentation of first fruits of the fishery as having somewhat complex motives behind it. In the first place it was intended as a thanks offering, and had also a propitiatory intent, yet at the same time it was regarded as a means of influencing through psychic rapport the fruitfulness of the fishery, for the fish and their tutelar deities were believed to be affected directly through the offering which served as a medium for transmission of the mana of the spells recited.

Today practically nothing is remembered concerning the religious practices connected with fishing, beyond the mere use of the stone *tii* mentioned above, which has persisted. From modern informants, and from the little that is preserved in the earlier literature, the following notes on the religious aspect of the fishing industry may be added to what has already been said. Consecration of canoes, nets, spears, lines, and hooks was an essential element in the success of fishing, for fish and fishermen, like all else, were under the control of tapu and the *mana atua.* This explains why women in former days never, and now rarely, went out in the fishing canoes.

The women being common (*noa*) would have neutralized the tapu of the craft, gear, and fishermen. Before starting out to fish, and in time of need while fishing, men had recourse, as in all other activities of life, to prayer spells. Christian prayers sometimes take the place of the older prayers nowadays. Formerly the fishermen took out with them the consecrated red feathers that were the talismanic representations of the major gods, but neither mana-endowed skulls nor carvings representing *atua* of fishing seem to have been carried in the canoes as in some of the other Polynesian islands.

RIGHTS AND RESTRICTIONS

Under the old system of government the *arii* had the power of laying a *rahui* upon any portion or all of the coast of a district or island that he ruled, or upon particular varieties of, or all, fishing. The laying of a *rahui* consisted in issuing an order which was carried through a country by his *vea,* or messenger, and strengthening the proclamation by means of a rite at the temple which added sanction of the *atua* to the authority of the *arii.* The removal of the *rahui* or raising of the tapu, required another rite at the temple entailing an offering to the *atua.* Such *rahui* were regularly declared as part of the established order of things to protect other varieties of fish, such as albacore, bonito, and "rock cod," during the spawning season; and the ceremonial opening of the season would seem to have been the culmination of this perennial *rahui.* General *rahui* were also proclaimed far in advance of a great feast or rite, such as the *oroa* in honor of the first-born of the *arii.* Less general *rahui* might also be established at times on a particular type of fishing, or on a particular place. Owners of fishing rights other than the *arii*—landed proprietors whose rights extended to the lagoon and reef, owners of weirs, fish enclosures, fishing rights in lakes, etc., have similar power of *rahui* over their smaller domains on the water, just as they had over their trees and crops on the land that was theirs. Of course, a proprietor always had the first rights to the fruits from his possessions, while outsiders were in general exluded without a *rahui*; but, besides his immediate family, there were innumerable *fetii* or "family connections," there were the *arioi* who helped themselves to everything in their way, there was the traveller to whom hospitality was owed, and finally, there was the *arii.* A *rahui,* being a ceremonial tapu, protected the proprietor against the depredations of all these when there was need, as, for instance, during the months when a man was accumulating supplies for some feast for his heir. Even the *arii* had to respect the tapu of a landowner's *rahui,* though, if it displeased him, he could force his subject to abandon it or supersede it with a general *rahui.* These private *rahui* were the counterparts, on a small scale, of the district *rahui* that were established by the chiefs.

The fishing rights were in the main controlled by the title to the adjacent

land. That is to say, the proprietor of a piece of land bordering the lagoon had also a proprietary right, but his was not an exclusive right, nor was the water and the reef restricted to the exclusive needs of his immediate family to the same extent as was his piece of land, for there were many *fetii* and hangers-on who shared with him his fishing rights, and others who, having a standing permission to fish in his water, paid for the privilege with labor and with fish. Elsewhere I have pointed out that propinquity to the most favorable fishing locality in the district seems to have been a factor of prime importance in determining the site chosen by the *arii* for his residence.

In particular instances there were special rights—appertaining to the *hui arii* usually—attached to certain localities especially favorable for some sort of fishing. The private ownership of the different fish traps in the lagoon at Maeva is mentioned in connection with the system of weirs at the place. Formerly the *hui arii* of Moorea had exclusive rights to the *ava* caught in the salt lake at Temae. This ancient right, though it is not now enforced, is still largely respected, being recognized in gifts of *ava* sent by the Temae fishermen to the descendants of the *arii*.

For the *manahune,* who made up the socially inferior portion of the population that dwelt for the most part in the interior of the valleys, having no rights of any kind, of land ownership or fishing, there was a special dispensation which allowed them to come to the sea, to fish unmolested, by a special road leading down the valley and through the lands of the *raatira, iatoai,* and *arii* to the shore. The privilege was, of course, paid for, as was the right of land ownership and fishing by the upper classes, by tribute paid to the *arii*.

FISHING GROUNDS

It is obvious that locality must be important as a factor in connection with fishing, for there are necessarily certain sections of the shallows and deep water that are more favorable than others for fishing in the various ways practiced. Good fishing grounds are termed *puna i'a*. There are several points peculiar to fishing in the Society Islands that deserve mention in this connection. The first is the existence of certain well-known and well-defined localities offshore where the albacore are caught, areas which are referred to as *puna aahi* or *apoo aahi* (albacore holes). These locations were as definitely owned under the ancient system as was land, and the rights to fishing in these areas are informally perpetuated in present native custom. This is true, in fact, not only of the *apoo aahi,* but of the fishing rights in general in the waters adjacent to a man's shore property. Thus at Papara today natives other than *fetii* of the family of the *arii* have to ask permission of the chief to fish in the lagoon, on the reef, and out at sea opposite the chief's place; and it is still the custom to pay for the privilege with a small contribution from the catch. It is interesting, however, that while

in the old days the chief controlled the right to fish for *aahi* outside the reef, it was the family that was in charge of the stone *puna* believed to control the fish that supposedly had the power of controlling the fishing itself. The family in question was, however, under the old system, subject to the *arii.*

The second point in connection with locality is the fact that the occurrence of good fishing grounds offshore appears to have been a factor of prime importance in determining the site selected by the *arii* for his residence. This is illustrated at Papara where the residence of the *arii* was and still is opposite the pass in the reef; and the same is true of the ancient site of the now abandoned *arii's* residence at Maupiti. At both these places the choice of the site opposite the pass in the reef may have been affected by other influences, particularly the convenience of being near the pass through which the large canoes of the old order had to sail, and also the necessity of guarding the pass at times against aggressors by sea. At Huahine the peculiarly favorable fishing conditions in the lagoon at Maeva led to this otherwise unattractive site being chosen by the conquering *arii,* and made it the "capital," or commercial, political, and religious center for northern Huahine.

Before leaving the subject of locality, it may be mentioned that it is important to know whether or not fish of a certain species are poisonous in a particular locality, for there are some varieties that may be eaten with impunity at one place, while at another they are deadly.

FISHING SIGNS AND THE CALENDAR

The subject of times, places, and seasons of fishery is one that calls for long and painstaking collecting of information. No more is attempted here than to indicate the general influences at work, and the general local conditions, by presenting such facts as have been gleaned in the course of moving about and stopping in different places in the Society Islands. I make no pretense of having "covered" this very important aspect of the fishing industry. For a comprehensive study of these matters, information from many different localities, and gathered over a period extending over a number of years, will be required. Should such a study ever be made the information collected will constitute an exceedingly useful record for natural science.

There are five factors that enter into the subject under discussion. In the first place there is the annual round of the seasons, during which the amount of rainfall, winds, currents, and temperatures all combine to affect fishing conditions and the habits of certain varieties of fish. Then there is the smaller round of the lunar month, during which the run of certain varieties of fish would appear to be definitely controlled by the phase of the moon. Locality is obviously an important factor: fishing grounds, and also the peculiarities of different islands and different parts of the coasts of larger

islands. Winds and the currents that are directly affected by them, are likewise directly related to favorable and unfavorable conditions and to the run of particular fish in particular localities. And finally, the native fisherman is equipped with a vast knowledge concerning the habits peculiar to each kind of fish. As a matter of fact, the experienced native fisherman is possessed of a store of precise knowledge that may be truly characterized as natural science. The factors mentioned may be taken up in order.

In general the rainy season is that in which the fishery is the most prolific source of food, though at almost all times there is an abundance of fish to be obtained in and near the reefs. The size and quantity of fish that make up the marine population frequenting the neighborhood of the reefs appears to be directly correlated with the season of the rains. Heavy rains cause flooding of the streams that drain the deep narrow valleys. When such miniature floods occur at intervals a great deal of food—some vegetable foods, also worms and insects, but particularly the fresh-water mollusks, shrimps, eels, *oopu* and *nato*—are swept down into the lagoons; and some doubtless pass through the break in the reef that is opposite the mouth of every stream. This, I understand, will lead the smaller fish, that live within and about the reef and lagoon, and certain larger varieties, such as bonito that feed on the small fry. Fishing conditions are in some ways good after heavy rains, because the fish are attracted to the passes and to the lagoons. (But muddy rough water, during storm and rain, of course, spoils fishing.) In addition to this, the fact that there is plenty of food probably leads to rapid growth of the fish during these months of rain. While there is no fixed seasonal period of heavy rains, in the Society Islands the storms come, for the most part, from November or December to March, and this period may for the sake of convenience be termed the rainy season. The Society Islands lie within the limits of the southeast trade winds which come upon Tahiti across the Tuamotu archipelago, blowing with the greatest constancy during the months of the southern winter. In the summer months, however, the trade winds become very weak.

The following report is from the United States Hydrographic Office (27, p. 82):

> The heat being then at its height over the Tuamotus, the evaporation of the lagoons attains its greatest intensity, so that during this season the Society Islands are nearly always subject to variable winds; and breezes, sometimes fresh from the westward, alternate with calms, storms, and returns of the trade . . . after a day or two of calm, the breeze springs up from the southwest, carying masses of cold air toward the Tuamotus. This cold air penetrating into the hot and moist tropical regions induces an abundant condensation, a rainy season, and squalls. Between the months of December and March this part of the Pacific Ocean is liable to be traversed by cyclonic storms, . . . [which] appear generally to be moving in a southerly or southeasterly direction.

The season during which the *aahi* and the *atu* are caught in greatest quantities coincides exactly with this period designated as the rainy season. On the leeward coast of Tahiti the special equipment used for *aahi* and *atu* fishing is conspicuous by its absence during the rest of the year. At Papara, Tahiti, October to March was specifically stated to be the season for this fishery. But on Maupiti it was said that the fishing for *aahi* with the *tira* continued all the year round. The use of the *tira* demands fairly smooth water; in fact, it is used only on the coast protected from the general effect of the trades. It may be that it is the frequency of the periods of calm typical of the summer months that made these the best for the *aahi* and *atu* fishing outside the reef, in spite of the fact that this was also the time for storms. During stormy weather there is of course no fishing outside the lagoons, and it would appear on the surface that the winter months which are not the stormy months would be the more favorable; but this time is unfavorable, for the steady trades keep up a continuous swell, which is sometimes very heavy when the wind is strong.

Under the old system, the season for *aahi* and *atu* was opened with prescribed formalities and religious rites evidently designed to make the season a prosperous one. The customs at this time are described as follows by Moerenhout (19, vol. 1, pp. 516-17):

> When, in the months of November and December, which were called *te tai* (season of the outside or of the sea), the bonito or scomber fishery opened, but a single canoe was allowed to go out to fish, and its entire catch was dedicated to the gods. This day was also tapu, that is to say, sacred. No one was allowed to approach the seashore, to make fire, to cook food, nor to partake of food before sunset. Nor could canoes or houses be built, or cloth manufactured, or mats or nets woven. In a word, all work was prohibited, and it was a day of silence and devotion.
>
> While the fishers were away, the priests applied themselves to praying at the temples; and their assistants were busy, in the principal marae, in cleaning it up, decorating it with green branches, in dressing an altar to receive the first fish caught. When the canoe returned in the evening, it lay in the water near the beach, awaiting the arrival of the priests. After some prayers and other ceremonial these allowed the fishermen to land and to bring to them the days catch, which, whatever it was, had to be carried in *toto* to the marae. There, after more prayers, two or three of the largest fish were placed on the altar, and the others were entirely consumed (? burned) on a fire that burned before the altar (on les consumait tous et entierement, sur un bresier allume devant l'autel).
>
> This first day's catch was for the gods; that of the second day was for the Arii, or chief; and it was only on the third day that the fishing was open to everyone, and anyone who desired could go fishing.

Moerenhout states that the bonito season was called *te tai,* which he translates as "the season of the outside or of the sea." Two seasons in the round of native life were quite distinctly marked off one from another: that during and immediately following the rainy season, when breadfruit, which was grown chiefly on the flat country between mountains and shore, and fish,

were plentiful, and the other half of the year, the drier season, when the population had to depend more on the island foods, chiefly taro and *fei,* and also sweet potatoes, yams, *ape,* and other land products. It is said that in ancient times there was something of a movement of population from shore lands to lands owned up in the valleys. The most favorable period for living in and enjoying the valleys was the dry season, which, as it was also a time unfavorable to fishing, was chosen by the *arii* for the camping expeditions and extended picnics the chiefs sometimes had, inland, as well as at shore residences. One informant, in discussing with me the numbers of house sites, taro terraces, and other evidences of ancient habitation in the now uninhabited valleys, attributed these to this annual movement of the shore-dwelling population, but it is my belief that such movement as there was was not very general, probably affecting only the chiefs and those connected with them and perhaps *iatoai* (nobles) who owned land both on the shore and in the interior.

Winds and currents not only directly affect the runs of certain fish, but occasionally appear entirely to control their movements. At Papara the following signs predict the appearance of the tiny *inaa* (*ina'a,* "white-bait"). From March to July, when a red cloud is seen in the south, it is known that the *maraamu* (southeast trade) wind, which bears obliquely on the coast here, will shortly blow. Then there will be no *inaa.* On the other hand, from September to January a red cloud seen in the northwest is the forerunner of the *toerau* (north or northwest) wind. With this wind will come the run of the *inaa.* It is not the run of the *inaa* in itself that interests the fishermen, but the fact that when the *inaa* swarm near the mouth of the streams certain other fish which are among the best for eating (the *aehaere, paehaere, omuri, uruati* or *urupti,* anciently *urua*), and others follow them and can be caught in the lagoon. Thus the effect, direct and indirect, of winds; and also the way in which a run of small fish attract the larger varieties that feed on them, are indications or signs.

At Papara, my friend, Moti Salmon, revealed to me something of the fishermen's intimate knowledge of scientific lore concerning the habits of particular fish. The *tarao* (rock cod) come from their holes three times a year to spawn. When they make their appearance they are speared in great numbers. At other times they are caught only occasionally in the lagoon with the hook and line, or net. Another fish whose habits are closely watched is the small *fao* that lives in the lagoon. Every three months, on the night "when the moon and morning star rise together," the *fao* go over the barrier reef into deep water to spawn, and three days later they return in the same way. It is said that they make their way over the reef even if there is only a film of water over it. When such a condition prevails, natives stand on the reef with sticks and kill them as they scramble over the coral.

In the discussion of the fishing calendar is brought out the fact that scarcity of fish during certain phases of the moon is associated, in the native mind, at least, with the blowing of the north wind.

The signs by which fishermen know when and where fishing will be good often have reference to the conditions that have been discussed in the pages just preceding, namely rains, the phase of the moon, the condition of the sea and currents as affected by different winds. The last illustration given above exemplifies the use of astronomical observation. Finally, an intimate acquaintance with conditions and appearances, a keenness of sense, and judgment acquired by continuous observation of these signs, generation after generation, enable the native fishermen to detect the presence of their prey in innumerable ways. Slight agitation of the surface by schools of small fish, hues of the water, shadows on the floor of the lagoon; all indicate to Tahitians, not only the presence of fish, but often the variety, when a foreigner is blissfully ignorant even of their presence. Flying fish emerging and skimming the surface indicate the presence of larger fish in deep water. Flocks of birds hovering over an area of water proclaim the presence of a school of fish. The way in which bonito fishermen discover and follow a school of bonito is particularly interesting. The bonito follow schools of "small fry." Sea birds, which feed also on these small fish, follow along with the bonito, sweeping down to pick up their prey as it swims near the surface or jumps out of the water in trying to escape from the bonito. Finally, the fishermen, following the movements of the birds that are following the bonito in pursuit of the "small fry," come upon the scene to catch the bonito with pearl-shell hooks especially designed to appear to the bonito like small fish as they skim the surface of the water. No better illustration could be given of the fact that ethnology should be pursued as a study in natural history. This fact is perhaps more aptly exemplified in the art of fishing than it is in the elements of culture less directly related to the physical environment, but it nevertheless holds true throughout the whole system of practices, habits, institutions, and beliefs that make up the culture pattern.

If Tahitian teaching concerning the habits of fish, is trustworthy—and it would be strange if it were not, for the food supply depends on fishing more than anything else—then the run of fish in the Society Islands is governed by phases of the moon. The Tahitians had a regular and definite fishing calendar, concerning which Queen Marau has most graciously informed me in detail. I have added some notes obtained later from Henry's account (15) which, in all essential details, corroborate the information derived from Marau.

The native names for the particular nights need not be mentioned, except

where the name of the night refers in some way to the fishing conditions. It should be remarked, parenthetically, that a "night" (*po*) refers to the period that transpires between the rising of the moon in one phase and its rising in the next. This period, which will include part day and part night, is the *po* referred to in the notes that follow. It is interesting to note that the names of many of the *po* refer specifically to the fishing conditions prevalent at the time.

During the first six *po,* fish are plentiful, and crabs come out along the shore on the second *po,* while on the third, named Hoata-tino-rua (Shining-double-body) swarms of fish "not fat" appear. [It is said that fishes are fat when the moon is full and thin when it is out; shellfish are included in this rule.] The ninth *po* is especially favorable for bonito. On the seventh, eighth, and ninth *po* the north wind blows; and on these nights there is no fishing. They are named, therefore, Mua-oreore (Before-scarcity), Roto-oreore (Between-scarcity), and Faa-oti-ore-ore (Finished-scarcity). The tenth *po,* described as *po ia ore* (night without finish), is named "Huna" (hidden) because on that night all the fish hide themselves. The tenth and eleventh *po* are said to be squally. On the twelfth *po* fishing begins again, and this night is named "Maharu" (to run and catch). Good fishing continues through the thirteenth. On the fourteenth fish is still plentiful; *maito* is caught especially, on which account the night is named "Maito"; or perhaps it was the fish that were named after the night. On the fifteenth, named "Hotu" (fruitful), *ua horo te mau ia atoa* (all varieties of fish run); and this condition prevails throughout the next *po.* On the seventeenth there is again a scarcity, for this is the night on which the spirits of the dead are believed to be about. On this night the land crabs and the hermit crabs come up on the shore, "to admire the moon." This habit of the hermit crabs, which often travel a considerable distance inland, and of the land crabs which live in holes in the ground near the shore is doubtless what has given rise to the belief that this is ghost night. The period of scarcity which begins on the seventeenth continues until the twenty-fourth, the greatest dearth prevailing from the twenty-first to the twenty-third, named "Ore-ore-mua" (scarcity-before) "Oreore-roto" (scarcity-between), and "Oreore-faaoti" (scarcity-finished). The north wind is said to blow on these nights, as on the other nights of dearth in the second quarter of the moon. On the twenty-third "the rocks are full of fish" (15). From the twenty-fourth to the twenty-seventh the fishing is good. These, it is said, are the nights when red fish, especially the *iihi,* are caught. The twenty-eighth marked the beginning of another short period of scarcity; but this was a good time for fishing with hook and line (*ia hi*).

SEA FISHING

Hook and Line

Hooks and lines of many sizes served to catch fish of all kinds, from the small fish in the streams to sharks and dolphins. A number of the types of larger fish, such as the *ava* (canos, or white salmon) and the *urua* (cavalla) were commonly caught with bamboo rod (*owhe*) and line. Men fish by this means from canoes; and women do a great deal of fishing with rod and line, wading out to a considerable depth in the water offshore, or passing along the barrier reef. Fishermen also troll in the lagoons at night. The standard method of fishing for bonito is with a long, heavy bamboo rod with a fairly short line to which is attached one of the pearl-shell fly hooks constructed so as to skim the surface (fig. 15, *a*). These hooks are

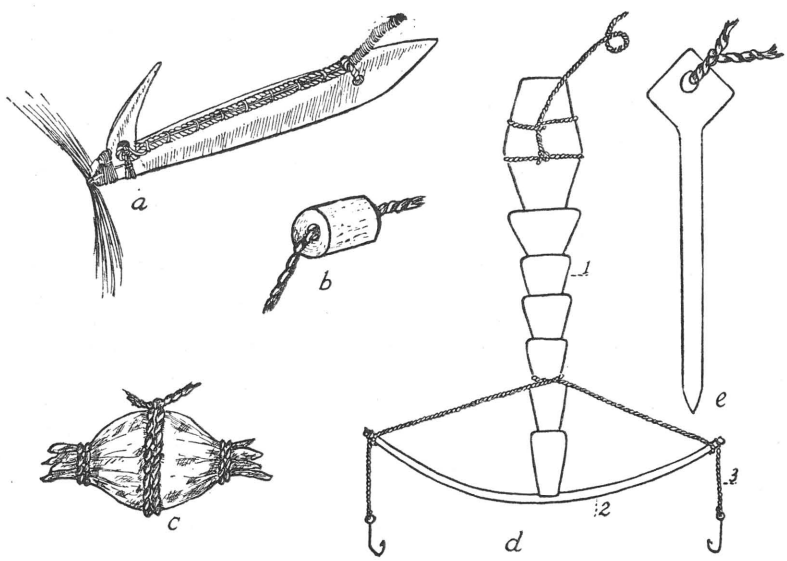


Figure 15.—Fishing apparatus: *a*, Tahitian pearl-shell bonito hook; *b*, float of *purau* wood; *c*, sinker; *d*, *haapee nape*: 1, notched wooden spike; 2, bowed twig; 3, line and hook; *e*, stake used on coral reef for holding end of net.

used without bait: skimming along the surface when cast and drawn along, the pearl-shell shank, seen from below is mistaken for a small fish by the bonito, which rises to the fly and snaps up the hook, shank and all.

Several kinds of lines (*aho*) were formerly used, but now it is rare that anything but commercial fishline is seen. The Spanish explorers that visited Tahiti in the latter part of the seventeenth century describe the use of human hair for making the finest line (7, vol. 2, p. 81), but the chances are that

they mistook the long fine braids (*tamou*), which were actually sacred ornaments and heirlooms made of relatives' hair, for fishing lines. Certainly, if lines of braided human hair were anciently employed in fishing they would have been made of the hair of enemies. For small lines the strongest native material used was the bast of the *rowa* (*Urtica argentea*) shrub, which was prepared and twisted as described by Handy (14). Lines of larger size were made of other types of bast such as *more,* the inner bark of the *Ficus tincturia* and other trees that supplied the material for cord making. Any quantity of these materials was easily obtainable, whereas the *rowa* was rarer; but none of the other basts compare with the *rowa* for tensile strength. Plaited coconut fiber sennit (*nape*) is not suitable for fishlines because of their tendency to knot and kink. Fishlines should always be of twisted cord.

In these days commercial steel hooks are universally employed. Formerly the smaller hooks were made of wood, pearl shell, tortoise shell, boar's tusk, or bone. A small cross section of a shin or arm bone of a man made an excellent ring of bone out of which a hook might easily be carved. For this, and for magical reasons, the tibia of an enemy was prized in the old days. The usage also gave the visitor a convenient means of desecrating the memory and degrading the soul of his slain foe. Thorns are described also as being used for small hooks (7, vol. 2, p. 282). The small shell and bone hooks are described by Ellis (10, vol. 1, p. 145) as "almost circular," and shaped in the form of a worm.

> The hooks made with wood were curious; some were exceedingly small, not more than two or three inches in length, but remarkably strong; others were large. The wooden hooks were never barbed, but simply pointed, usually curved inwards at the point, but sometimes standing out very wide, occasionally armed at the point with a piece of bone. The best were hooks ingeniously made with small roots of the aito tree, casuarina, or iron wood. In selecting a root for this purpose, they chose one partially exposed, and growing by the side of a bank, preferring such as were free from knots and other excrescences. The root was twisted into the shape they wished the future hook to assume, and allowed to grow till it had reached a size large enough to allow of the outside or soft parts being removed, and a sufficiency remaining to make the hook. Some hooks thus prepared are not much thicker than a quill, and perhaps three or four inches in length. Those used in taking sharks were formidable looking weapons; I have seen some a foot or fifteen inches long, exclusive of the curvatures, and not less than an inch in diameter.

J. R. Forster wrote of these large hooks (12, p. 462): "The largest of all have a shank made of wood or bone covered with a brown mother-of-pearl shell, and have a hook of tortoise shell, which is often made of two pieces tied together."

This description evidently refers to a larger form or type of hook termed *aviti,* such as is used for fish like bonito, and albacore (fig. 15, *a*). A section including a thick portion of the hinge of the shell is cut out of the large pearl shell. At the thicker end, which is pointed and beveled on the inner

face, a small hole is bored through; and at the thin end, which is squared off, several grooves are made to hold the cord that lashes the hook to this shank. The shell shank is well polished in the underside so that it will gleam in the water. Nowadays a large metal hook is lashed upon the inner surface of the shank at the lower end. Formerly bone or tortoise shell hooks were used, being lashed to the shank. The cord to which the *avati* is attached runs the length of the shank on the inner side, being attached at the hole at the upper end either by passing through it or by means of a separate small lashing, and at the lower end to the bone point. The weight of the fish caught is of course carried by the point; it is necessary, therefore, to have the line attached directly to the point, otherwise the weight of the fish would carry away the small lashings. On the underside of the lower end of the shank is lashed a bunch of horsehairs or hogs' bristles, at right angles to the shank. The tufts of hair on either side, flaring out behind and moving as the hook is dragged on or through the water must give a very realistic impression of the tail of a small swimming fish.

Apparently in the days when Ellis wrote bait was little used. The appearance of the hooks, which were thick, and in the smaller bone and shell hooks, shaped to resemble a worm, was evidently sufficient to entice the prey. Nowadays with commercial steel hooks in use, bait has to be used. For this purpose are used the small fry caught along the shore or in streams, shrimps, worms, sea-snails, hermit and other crabs, bits of coconut meat, etc. Often, in addition to baiting his hook, a man will scatter bait about his canoe to attract fish. Small fry are sometimes chewed up alive and the scraps thrown on the surface about the canoe. Sharks are sometimes attracted by a chunk of meat dangled or towed in the water.

Nets

seines

During the seasons of plentiful fish, long seines were, and still are, employed for making large hauls. For different kinds of fishing there were nets varying in length and breadth, in size of mesh and material from which the cord was made. The large seines (*upe'a*) were always owned by the district chiefs who regarded the fishing grounds as their property.

According to Ellis (10, vol. 1, p. 141), the ancient usage in Huahine, when a large net of the type used in catching *ava* was to be made, was as follows: Having killed and baked two hogs, the proprietor of the net (doubtless always a chief) sent a messenger bearing some of the pork to each of his brother chiefs with a message that a specified quantity of netting was desired as a contribution toward the projected seine. The acceptance of the gift of food, which was termed *tarahu* (pay)—and the gift is said always to have been accepted—signified compliance on the part of the recipient. The

servants of the chief also supplied a certain quantity of netting, and the chief himself worked among them. In Papara, Tahiti, I was told that the district chief, when he planned to make a new net, would assign a certain number of fathoms, depending on the size of the seine to be made, to different groups (*pupu*) in the district. On the tiny island of Maupiti, where one seine served the whole population of the island, it was the custom of the chief to assign ten fathoms (*etaeta*) to each of the eight *matainaa,* specifying the material to be used and the type of net proposed. It is evident that practice in this matter was practically uniform throughout the group.

When a new seine had been completed on Maupiti, there was a feast with accompanying religious rites. Ellis (10, vol, 1, p. 142) mentions without giving specific details, prayers and presentation of offerings at the temple and on the beach, when a new seine received its first wetting.

The manufacture of the different kinds of cord employed in making nets, and the weaving of the mesh itself are described by Handy (14). The size of mesh and materials used for certain of the large nets are also mentioned below.

Small beach boulders wrapped in pieces of the fibrous leaf sheath of the coconut tree (*aa haari*), which is wrapped around the stone and tied at either end, are used for sinkers. On an *ava* net observed in Huahine sinkers (*ofai*) were lashed at intervals of 51 inches along the rope forming the lower margin of the seine by means of cords passing around the middle and at either end of the sinkers (fig. 15, *c*). Sections of light dried *purau* wood 2 or 3 inches long still serve as net floats, as they did in ancient times (fig. 19, *b*) (10, vol. 1, pp. 141-2). On Huahine the floats are termed *poito.* Those on the *ava* net just mentioned were 4.5 inches long and 2 inches in diameter, and had bored through the middle a hole through which passed the cord that attaches it to the net. These were placed at intervals of 12 inches along the upper margin of the seine. In using the long seines on the reefs, stakes of *purau* wood (fig. 15, *e*) are sometimes employed to hold the end or ends of the net fast. The stake, which is about two feet in length, is stuck upright in a hole or crack in the coral and the end of the net is tied to it. With one end held fast in this way a single man can put out a net of considerable length. Stakes like this are used also when a net is put out and left overnight.

Some of the seines used in ancient times were of great length. Early visitors to Tahiti observed nets as much as 30 to 40 fathoms long (30, p. 385; 7, vol. 2, p. 282). In modern times nets of considerable size are employed, but there are probably none equal in length to those of the ancient industry. The manner of drying nets is shown in Plates XX and XXI.

A large *upea* with small mesh for general fishing was observed at Papara, Tahiti, in use in the following ways. In calm weather it was frequently put

out in the deep water of the lagoon near, but not across, the passage of the reef that is opposite the mouth of the fresh-water stream. There it was left for a day or a night. It was used also opposite the passage through the reef in the following way. From the shallow water just offshore a canoe would carry one end out toward the passage, around, and then in toward the shore, describing a semicircle so that the extended net formed a "U" opposite the passage and opening landward. It would then be gradually drawn in by hauling in at either end, several men at the same time swimming along the seaward side and diving occasionally and watching for fish entangled in the net and trying to keep the bottom of the net as much as possible on the floor of the lagoon. In the deep water of the lagoon, long seines were used also with a bag net (*tete, toto* in Raiatea), or large shallow bag made of heavy small-meshed netting. The bag net having been first put down with its lower margin well weighted to the bottom, two long seines would then be run out from either side of the bag at an angle of from 45 to 90 degrees, their lower margins being weighted down to the bottom for their full length and the upper held up by floats. The fishers in canoes paddle around beyond the opening of the nets, and then come up toward it slowly, more or less in line, beating the water with long poles to frighten the fish ahead of them; so they draw right up to the bag at the juncture of the nets, driving the fish into it. Several men then jump overboard, dive down, bring up the bag, and dump its contents into a canoe. This may be repeated a number of times in different places in the lagoon. The long poles are used not only for splashing to frighten the fish, but also for poking about in the holes in the coral to drive out the fish that have taken refuge in these.

Wilson (31, p. 385) describes long seines used for catching schools of flying fish. A net 70 to 90 feet long and 9 feet deep was carried out in small canoes and shot around the fish, which were frightened into it by the fishermen's splashing the water and rapping on the sides of their canoes with their paddles.

The *upe'a ava* intended for catching the *ava,* the most valued local variety of fish, is described by Ellis (10, vol. 1, p. 140) as "the most important" of the native nets, and as one that was "seldom possessed by any but the principal chiefs," doubtless for the sufficient reason that they controlled the *ava* fishing grounds. These used to be as much as 40 fathoms long and 12 feet deep. At Huahine, a modern *ava* net belonging to the chief of Maeva, and made of modern commercial cord with a 5.5-inch mesh, was only 16 fathoms long, but was considered very short even today. I was told here that such a net is never dragged. Men dive down and catch by hand the fish entangled in the meshes by their gills.

Sharks were sometimes caught by use of the large nets made from the bast of the breadfruit tree. Other trees that sometimes supplied the bast

for this purpose were the *ora, mati, roa,* and *purau.* The bark was scraped and twisted to form heavy cord which was then made up into a very heavy coarse net with large meshes.

An unusual type of net is that used for catching the *operu,* a small mackerel which frequents the coast in great numbers at certain seasons. When a run of *operu* is on, a large net is quickly made with plain strips of *more* from 1 to 2 inches wide, tied so as to form a 9-inch mesh. The completed net is about 200 yards long and 5 yards wide. The school of *operu* is encircled. It is said that although the fish could easily pass through the large meshes of the net, fright makes them retreat from it so that it holds them as well as would a small net. The net with the entrapped fish is drawn up into shallow water where the fish are caught with lading nets; or, preferably, if there is an *aua operu,* the two ends of the net are drawn up to the entrance, through which the fish escape into the enclosed ponds. (See Pl. XXII, *A.*) When all the *operu* are inside the entrance is closed. Then the fish can be taken out of the pond with hand nets as they are needed. Ellis (10, vol. 1, p. 140) speaks of the nets for *operu* fishing as being made of "the twisted bark of the hibiscus," meaning probably the inner *purau* bast (*more*). He says also that "several nets were used at the same time, the meshes of the outside net being very large, and those within smaller, for the purpose of detaining the fish." Probably the smaller net was employed to take the place of the *aua ia* as a receptacle in which the *operu* were forced and entrapped.

CASTING NETS

In the shallow water along beaches where close-packed schools of small fish run, small casting nets are often used. The net, gathered up and carried over the right shoulder and arm, is flung dexterously out over the school of fish. If well thrown, it falls over and around the fish, imprisoning them. It is then carefully gathered up, the weighted sides being drawn in under till they meet, forming a closed bag in which the fish are held. The only modern net of this type observed was a ready-made commercial casting net of the usual form, with lead sinkers. It is evident, however, that casting nets of native manufacture were formerly used, for Ellis (10, vol. 1, p. 140) mentions this method of fishing, without, however, describing the net. The skill required in fishing with a casting net lies not only in the casting itself, but in the ability of the keen-eyed fisherman to detect the presence of small fish along the beaches. In part, it is a matter of keen vision, in the observance of such signs as slight rippling of the water, the reflections on the sandy bottom that reveal the presence of a school. While the uninitiated will stand and gaze at still water a short distance away from him, which to his eyes looks like all the rest, the native fisherman will suddenly begin to step stealthily and expectantly along the beach toward some spot, where he

swiftly casts his net with a great swing. The net spreads wide, the sinkers fall with a succession of little splashes in the water, and underneath is the fisherman's supper, or, more likely, bait for larger fish.

DEEP BAG NETS

The *upe'a tapiri manino* (Pl. XXI, *C*), a very deep bag net used in fishing on the reef, requires two persons to handle it: one to hold the hoop, the other the end of the bag, to keep it from catching on the coral. As the net is dragged gently through the water fish that go through the hoop pass on back into the deep bag whence they cannot escape.

FLYING FISH NETS

On certain nights of the moon flying fish lie on the surface of the sea in great numbers. At these times fishermen go out with torches and scoop them up with the *upea marara,* a landing net composed of a small bag and long *purau* handle (Pl. XX, *B*). The net itself is a shallow bag woven directly on the hoop and on the crosspiece. It is made of commercial twine with 1.5-inch mesh. The lashing is that used in all hoop nets of this type:

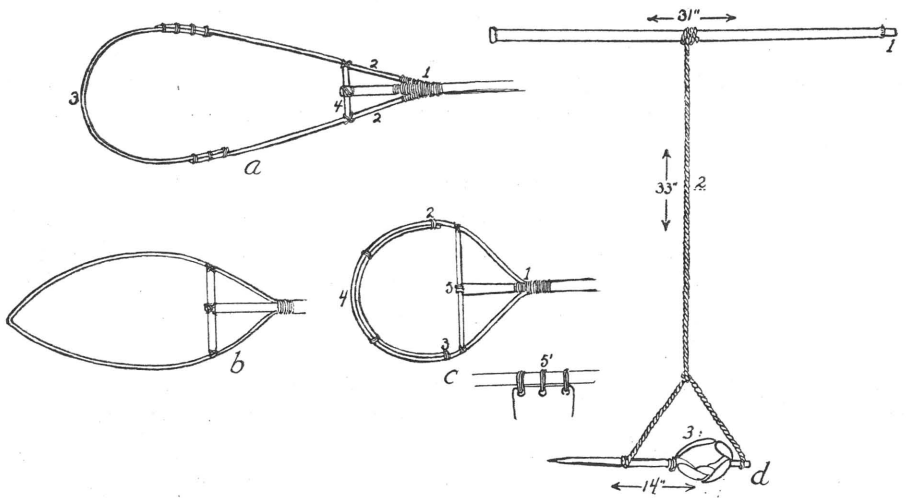


FIGURE 16.—Fishing apparatus: *a*, landing net for flying fish: 1, lashing at crotch; 2, prongs; 3, bowed end piece; 4, brace, length of pole to lashing at (1), 12 feet; from (1) to (4), 10.5 inches; diameter of net from (4) to (3), 25 inches; greatest width of net hoop, 14 inches: two sticks of orange wood (2) are lashed to the pole at (1), and to the end of the pole a crosspiece (4) is lashed, while the sticks are spread and lashed to either end of the crosspiece, and a third stick of orange wood (3) is bowed and its ends are lashed to the projecting ends of the sticks (2); *b*, landing net for use in holes in the reef; *c*, landing net for use in the Maeva fish traps: 1, lashing at crotch; 2, 3, bowed overlapping prongs; 4, distal extremity; 5, junction of pole and brace: length of handle, 36 inches; from (1) to (5), 18 inches; from (5) to (4), 35 inches; diameter from (2) to (3), 41 inches; *d*, octopus lure: 1, handle; 2, cord; 3, cowry-shell plaques.

at first the cord is simply bound round and round the handle and the ends of the sticks forming the net frame; but after a number of turns in this way, the sticks are drawn out and the lashing passes over the handle, down under and around the stick, under the handle, up over and around the opposite stick, and so on. The lashing ends by finally being passed a few times around the handle in overlapping loops (fig. 16, *a*, 1). All the lashings on the net shown in the plate are of commercial cord.

NARROW LANDING NET FOR USE IN HOLES

On Huahine was observed an interesting variation of this type of net (fig. 16, *b*). It was impossible to examine this net closely, for it was seen on a near-by shore from a passing canoe. The pole was approximately 8 feet long; the net frame about 2 feet long and less than 1 foot wide. It held a shallow net of small mesh. One unusual feature of this net was the fact that the outer end of the hoop was pointed instead of being round. Another peculiarity was its narrow latitudinal diameter. The latter feature is explained by the fact that it was intended for reaching into holes in the coral under water and lading out entrapped fish.

MAEVA LANDING NET

A type of large landing net that is made in the same way as the *upea marara* is used at Maeva, Huahine, for taking fish out of the traps in the lagoon (Pl. XX, *C*, fig. 16, *c*). These are termed by the Maeva people simply *toto* or *toto ta ipu ia,* or *toto haipu. Toto,* according to Emory, really signifies the bag of the net. The handle (*aau*) is made of *purau.* The sticks, "2" and "3" forming the rim (*tutu*) are made of ironwood. The lashing at "1", where the sticks are bound to the handle, is the same as in the flying fish net, but instead of being made of three sticks as is the *upea marara,* the rim is formed of two sticks which are bowed around and lashed one upon the other so that they overlap to form the whole outer side of the rim. The crosspiece (*tea*), "5", is also made of ironwood. This crosspiece is lashed to the end of the handle as shown in figure 16, *c,* 5. The lashings (*taamu nape*) are all of braided sennit (*nape*). The net, *toto,* itself is made of commercial twine woven in 0.75-inch mesh. Formerly cord of spun *purau* fiber (*more nino*) was used. As shown in the plate the bag of the net is of considerable depth, measuring 63 inches.

FISHING SPEARS

A great variety of fishing spears were employed in many ways. Spears with different numbers of prongs—the most common type seen—are used in shallow water, on the surface of the fringing reef; to spear fish in the inrushing surf on the barrier reef; in fishing along the reefs and lagoons in

canoe both by day and by torchlight; for spearing fish trapped in holes in the rocks or coral along the coast, in *aua ia,* in long seines, or in the *rau ere.* A short spear with a single prong (*auri no te titia*) is used for fishing while swimming under water in the shallow lagoon. A heavy spear with single point and long shaft, and usually with a cord attached to prevent its loss, serves for large prey such as sharks.

Today all kinds of spears are generally termed *auri patia* (iron piece). Forster (12) records that spears for fishing were called, at the time of Captain Cook's visit, *tao vero ia* (spelled by Forster, "E-tao-werro-eiya", lance to pierce fish). All spears with single points are *auri pu hoe* (iron one-point). Three-pronged spears (*auri pu toru*) are preferred for turtle fishing. *Auri pu pae,* having five prongs, are best for "parrot fish" and others of medium size, while for larger fish such as Barracuda the *auri pu hitu,* with seven prongs is used. In some spears the points are plain; but in the larger spears they have a single barb.

Size, material of shaft, and the size of the point of the prongs of spears, vary according to their intended use. The largest and heaviest fishing spear is that intended for shark. It has a heavy handle made of *manono* wood (*Phyllanthus manono*) to which a rope is attached, and a heavy point made of a small rod of iron sharpened at the exposed end. Lighter spears have long shafts made of *purau.* Their prongs vary from about 3 to 12 inches in length, and are made of lengths of iron rod sharpened at the point and lashed on the end of the shaft with commercial twine. Formerly plaited sennit was employed.

Before the introduction of metal by the Europeans the prongs of fishing spears were made of ironwood (31, p. 386), and spears are described (10, vol. 1, p. 143) as having 9, 10, or 12 prongs from 6 to 8 inches in length. Forster mentions "harpoons of reed pointed with hard wood shaped in the manner of the bearded head of the arrow" (12, p. 462).

FRESH-WATER FISHING

Fishing in fresh-water streams was a means of obtaining food and also of securing bait to be used in marine fishing. The small percoids (*nato*), which inhabit the lower parts of streams, are caught sometimes with hook and line. These and the small dark *oopu* (gobie) caught in large numbers at the mouths of streams in baskets, nets, or weirs, were used as bait for marine fishing. Shrimps, used in preparing certain native dishes and also as bait, were caught by means of traps and sieve-like baskets (Pl. XXV). Today they are often scooped up with a piece of dark cloth which is drawn along under water by a woman wading. Children catch them with their hands, and also impale them with small spears. The fresh-water eels, which

make excellent eating, are caught at night. A flaming torch attracts them to the surface and to the edge of the stream, where they are speared.

In times past a chief would occasionally retire with his retinue and guests to some sequestered spot in the depths of one of his valleys. Temporary shelters were built and inhabited during the time of the extended picnic. At these times the following practice was sometimes resorted to with the object of obtaining a plentiful supply of fresh-water foods. A suitable place being chosen, the stream was diverted from its natural course for a considerable distance. Below the diverting dam, in the normal stream bed, the water would gradually draw off and seep away, leaving a great quantity of *nato, oopu,* shrimps, and eels stranded and imprisoned in holes, rocks, crevices and pools. These, having no way of escape, were easily caught.

During the rains, when fresh-water fish were brought down in quantities by the swollen streams, there were several ways in which large catches were made at the streams' mouth. A number of practices are described (31, p. 387) in the account of the visit of the *Duff*. It is said that a "vast bag" would be made of coconut husk (fibrous leaf sheath) sewed together. Such a bag had a wide-open mouth which received the stream, and was held in place by stones. By means of the *rau,* (31, p. 242), the fish, and other creatures above the bag, were swept into it. Women would sometimes also take bag nets and, forming a line across the river, hold the bottom of the nets fast with their feet and the mouth open with their hands. The catch was put in the baskets.

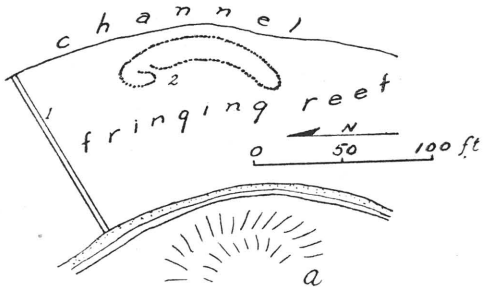
Stone Weirs

Rough weirs of stone were and still are built at the mouths of streams. They consist simply of boulders piled up across the stream mouth leaving a small sluice through which the water escapes. Across this a net is held; then men and women drive fish and so forth into the sluice, agitating the water above by splashing and plunging. There are frequently above the mouths of large streams broad and deep pools in which a great quantity of small fry live.

A weir of coral stones was observed by Emory on the east coast of Maupiti. The stones were roughly heaped up in a thin wall which described the vertically-elongated "C" shown in the plan (fig. 17, *a*). The water in which the weir stands is about a foot deep at low tide and nearly two feet at high tide, when the top of the wall is almost submerged.

Duperrey (9) in his map of Borabora traces a group of weirs running out from the northeast shore, at a place named Poia, where there is a shallow in the lagoon. He shows seven enclosures connected by a single wall. The configuration that he gives can not be taken as exact: for instance, no entrances are shown.

On the east coast of Tahaa, at the islet Toahotu, is the weir of coral stones shown in figure 17, *b*. It was built long ago and about to be repaired in 1919. According to Monsieur L. J. Bouge who furnished the data concerning the weir in answer to inquiries made by Mr. J. F. G. Stokes, it was in operation from October to December. The fish entered, on the incoming tide, either of the two divisions. The passes were then blocked with nets, and the fish in division *1* driven in to division *2*, which was then made to serve as a vivarium. The fish were taken out by means of scoop fish nets.



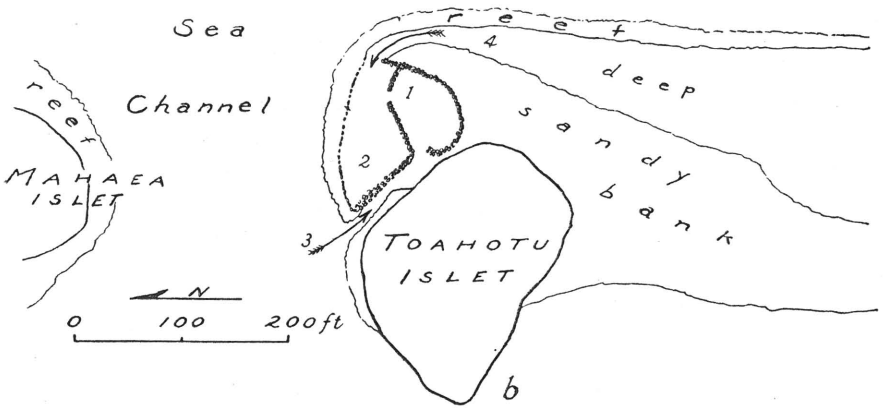


FIGURE 17.—Fish weirs: *a*, fish weir on fringing reef of Kauwaa (Kauwa'a) Hill, Petee District, Maupiti: 1, ruins of stone jetty; 2, the weir of coral stones built up flush with the water at high tide when the depth is nearly two feet (based on a rough sketch made in 1925 by K. P. Emory); *b*, fish weir on east coast of Tahaa: 1, 2, enclosures of coral stone into which fish are led by the incoming tide through the channels, 3, 4. The entrance between (1) and (2) is used to chase fish from (1) into (2) when it is wished to convert (2), which is 3 feet deep, into a vivarium (plan given to K. P. Emory by Monsieur L. J. Bouge).

Ponds

The fish ponds (*au'a i'a*), used in connection with the *operu* fishery were always roughly built; and served only as temporary enclosures intended to retain the *operu* when caught in large numbers. There was not, in the Society Islands, any development of fish ponds comparable to that in Hawaii where great numbers with large, extensive, and well-built walls were anciently constructed with admirable skill, to serve as permanent salt-water ponds in which mullet was kept and raised. In the Society Islands there are not even many of the rough *operu* enclosures. At Huahine I know of only one, near Tiare Pass on the east side of Huahine-nuï. On the west coast of Borabora there is, according to Emory, one made with stakes at Tereia point (Pl. XXII, *A*) consisting of a fence, 25 feet long, 18 feet from shore, standing in 3 feet of water and connected to the shore by a log barrier. A gate, 4 feet wide, made like a section of the fence, closes the entrance in the northwest corner. The fence is of *purau* stakes driven into the firm sandy bottom an inch or two from each other and connected at the top by means of

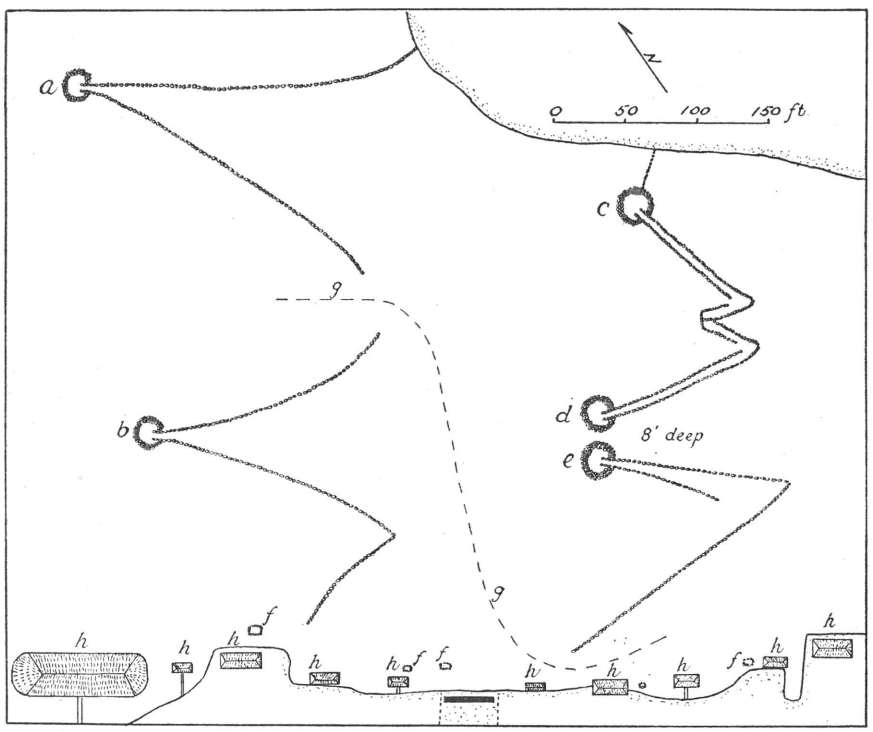


FIGURE 18.—Plan of fish weirs and traps in the lagoon opposite Maeva village, Huahine: *a*, Au'a Tahiverevere; *b*, Aua Wahamoa; *c*, Aua Momona; *d*, Aua Tepua; *e*, Aua Puaaoviri; *f*, fish ponds; *g-g*, passage of canoes; *h*, houses (based on a pace survey made by K. P. Emory in 1925).

slender vertical poles bound on the outside with unprepared *more*. The gate has two of these horizontal poles: one at the top and one at the bottom, and in addition a transverse pole; all are lashed on the inside. The log barrier consists of two or three logs held between pairs of stakes. The stakes are held tightly against the logs by means of a strip of *purau* bark wrapped between upper ends of the pair of stakes. Another on this island is said to have an entrance built with a floor of stone that forms an inclined plane on the outer side, doubtless to facilitate drawing the net up to it and the passing of the *operu* into the enclosure.

At Maupiti there is to be seen in a small inlet on the north side of the island the remains of an *operu* enclosure, consisting of two sections of rough wall showing just above the surface of the water. These walls jut out into the lagoon from points 100 yards apart on the shore and form an arc of a circle. The walls disappear about 100 feet out from the shore; they approach each other at an angle of about 90 degrees, and if continued in a straight line would meet about 100 yards from the shore, at what was—or is, when it is in repair—the entrance. The enclosure thus formed is roughly triangular, and large enough to hold a quantity of *operu*.

The houses along the shore of Maeva village, Huahine, have small rectangular fish ponds in front of them. (See fig. 18). In these ponds, fish taken from the weir-traps are kept. The walls are of rough basalt stones, piled to a foot above water. At many places along the shore of Fauna Nui lake, Huahine, are to be seen in the shallows the remains of *au'a i'a* of this type. The shore often forms one side of the enclosure, at one time, two sides, In size they vary from 30 to 50 yards in length and breadth.

WEIR-TRAPS AT MAEVA, HUAHINE

By Kenneth P. Emory

The most interesting and unique development in the Society Islands in the way of weirs is at Maeva, on the northeast coast of Huahine. (See Pls. XXII, XXIII, and fig. 18. Here there is a very long and very narrow lagoon which runs in between the mainland and an elevated barrier reef from Haamiti on the east coast, connecting the open sea through Tiare Pass with a broad, shallow salt lake named Fauna Nui, west of Maeva. When strong easterly winds blow, the sea is forced in through the pass at Haamiti, and there is a strong flow into the lake through this neck; while the reverse movement of the sea-water takes place when the wind falls or is in another direction. It is said that a conjunction of full moon with easterly winds produces the most favorable fishing condition at Maeva. No doubt the brilliance of the moonlight on the floor of the lagoon attracts the larger fish seeking prey, and the flow of water caused by the wind draws them into the lake from the ocean. There is also a daily ebb and flow caused by the tides:

full high tide takes place shortly after midday, as the Society Islands furnish the remarkable phenomenon of solar tides.

In the neck of the lagoon which opens into the lake at a point opposite Maeva village is a series of five systems of weir-traps which were built in pre-European times and for which Maeva is famous. The weir-traps are arranged to lead fish, coming into the lake or going out of it, into ingenious traps from which there was little likelihood of escape until someone came to take them. When all five series of weir-traps, referred to as *horo i'a* (fish runs), were in operation the chances of large fish from the sea reaching the lake, or vice versa, without being trapped, were negligible. All traps, except the pair at the very entrance to the lake, face so as to intercept the fish following the flow of water out of the lake, or the shrinking of the tide. At present [1925] only the two westernmost *horo i'a* (fig. 18) are kept in repair; the middle one is neglected, and the other ones are in ruin.

The weir-traps are built of flattish blocks of dike rock, such as may be found on Matairea hill, back of the village. They are laid up in fairly vertical walls resting on the hard sandy bottom and rising one to two feet above the high-tide mark. (See Pl. XXII, *B*). The bottom of the lagoon shelves off gradually to 8 feet in mid-channel.

Each series of weir traps spans the lagoon except for a narrow but deep pass in the middle, and a broader but very shallow pass between their termination and the village shore. These passes are sometimes temporarily blocked with nets or with lines of coconut leaves.

The pair of western weir-traps shown in figure 18 and Plate XXII, *B*, are named Aua Tahiverevere (Tahi-verevere), or Taiverevere (Ta'i-verevere), and Aua Wahamoa, or Hamoa; the three eastern weir-traps (fig. 18) are named Aua Momona or Ope, Aua Tepua (Te-pu'a), and Aua Puaaoviri (Pua'a-oviri, Wild Pig). (See Pl. XXIII.) The term *aua* (*au'a,* enclosure) is usually applied to these weir-traps, but the technical native name for such traps as these is *haapua.* Two of these—we failed to ascertain which—anciently belonged to the Arii, while others belonged to other families. Nothing in the nature of communal rights existed in connection with these walled fish traps: every trap belonged to some family and was inherited as was land. It was these fisheries which made living very easy and led to Maeva becoming the place of residence of the Arii and hence the ancient capital of the island.

The traps themselves (*haapua*) are circular enclosures having an inside diameter of 15 to 20 feet, walls 3 to 4 feet thick, flat on top, slightly broader at the base than at the top. On one side of the enclosure (see fig. 18) is an opening, 4 feet wide, from each side of which extends a wall from 1 to 2 feet wide. These walls continue, or project, 6 feet within the enclosure; where they end is the entrance, 4 feet wide. This entrance is partly blocked

with several stones loosely piled on the bottom; the two lead walls projecting into it are the *arero* (tongue) of the *haapua;* the space to each side of the *arero* is the *pepeu* of the *haapua.* Two to three feet of water lies in the bottom of the trap at low tide. The two walls leading from the entrance of each of the two western traps flare outward. Fish entering the lake from the sea are intercepted by them providing they do not strike a pass. Also, fish which have entered the lagoon and turn back to the lake are likely to be blocked by these weirs. The converging barriers lead them into the enclosure, where, seeking to escape, they swim around the basin to the left or right until they meet the *arero,* which diverts them away from the opening.

The leads of the *haapua* of Aua Momona and Aua Pua operate upon a more complex and original principle. The lead walls continue outward at about the same distance from each other and this double wall bends to enclose a wedge-shaped area of the lagoon. The bend is termed the *mata hoto.* The fish coming out of this lake and drawn into this wedge enter a gap (*uputa*), 5 feet wide in the inner wall. If they turn on the side of the blind alley and are not held there by someone with a net, they work back and are naturally led into the long runway (*rauoa*), which leads to the trap.

Aua Puaaoviri is constructed on the same principle as Aua Tepua, but lacks the blind alley. What advantage, if any, the indirect lead has over the direct lead into the traps we did not learn. Possibly it lies in the fact that fish escaping from the trap might automatically be led back into it. We must not overlook the probability that the type of trap was regulated by the chief, so that advantages were distributed according to rank and deserts: one man would not be allowed to construct a trap so efficient as to intercept and trap all the fish coming from the lake.

When a school of fish entered the area between the eastern and the western weirs, shown in figure 18, during the day, the passes were often blocked by nets, lines of leaves, or women and children shouting and splashing, and the fish driven into traps. Every morning, however, fish were usually found in them (10, p. 138). These fish might escape unless the *arero* is blocked. Tyerman (26, p. 276) tells of a conscience-troubled Christian native of Maeva who, seeing a great many fish in his trap on a Sunday, and fearing that they might escape before morning, could not resist breaking the Sabbath by putting a few large stones at the entrance.

When fish in the traps are reported, usually by a boy who has been stationed for that purpose, the owners pole out in a small canoe, taking with them their special dip-nets (*toto haipu*), step onto the broad wall of the trap, and begin scooping with their nets (Pl. XXIII, *A*). A man who wishes to dip again after securing several fish, grabs the bag of the net, giving it several twists to thoroughly entangle the fish in the bottom. Occa-

sionally the fish are speared (Pl. XXIII, *C*). The fish caught are mostly *rai, paaihere, ava, ioyo, piritia, faiia,* and crabs, and doubtless many other kinds.

Of the three remaining series of weir-traps at Maeva the easternmost consists of a single trap with a direct lead; the one next west, a single trap with an indirect lead similar to that of Aua Tepua; the weir-traps west of the last are named Aua Tuai (Tua'i). They consist of a pair of traps arranged exactly like the two traps, Aua Tepua and Aua Momona. The map of Maeva village (fig. 18) shows the configuration of Aua Tuai. All these traps are turned toward the lake. A northerly wind will, as Tyerman witnessed (26, p. 276), cause shoals of lake fish to emigrate from the upper end of Fauna Nui lake, and flock for shelter in the region of the weirs.

No weir-traps elsewhere on Huahine or the other Society Islands were seen. A much more exhaustive search and inquiry than was made would be necessary to determine whether they did or did not exist. The principle upon which they worked must have been known throughout the group. Captain Bligh (16, p. 113) mentions a "ware or dam . . . made with stones without Point Venus [Tahiti] in order to catch fish," which might have been a weir-trap. Stokes (23) has recorded this type of trap with direct leads, from Tutuila, Samoa, and from the Marshall Islands.

CONTAINERS, TRAPS, BASKETS

The most common form of container (*haapee, haapua i'a*) is that shown in Plate XXV, *B*. Briefly, this is a cigar-shaped container made of bamboo in the following way: for the smallest *haapee*, a single long joint of bamboo; for the larger ones, a stem as long as is required. Slits are made down the whole length of the bamboo, making a number of narrow strips running the whole length, but still held at the ends where the terminal joints of the bamboo shaft are held intact. The narrow strips are then bulged outward or spread, and two hoops are inserted over the width so that the whole section of bamboo assumes the cigar-shaped form typical of the *haapee*. In the open interstices left where the strips have been spread apart, separate supplementary strips of bamboo running the length of the *haapee* are inserted. These serve to close the open interstices between the spread strips. At the terminal joints and upon the hoops the strips are lashed firmly with *nape anave* (cord) which, at 3- to 4-inch intervals along its whole length, passes around the body of the basket, binding the strips firmly together, several types of stitch being employed. In the middle basket, between the hoops, a small square opening is cut. A lid (*opani*) is made to cover this by lashing together short strips of bamboo in the same way as is described above. And on either side of this opening, running longitudinally, is lashed a short piece of peeled and dried *purau*. These pieces of *purau* serve as

floats which keep the opening up and at the surface of the water when the *haapee* are employed in deep water. This type of container, made with fern stalks, was seen on Borabora (14, Pl. XXV, *C*). Uses for *haapee* are various. The smaller sizes serve for keeping and carrying the small fish, and shrimps, that are used for bait. The larger *haapee,* on the other hand, are containers in which larger fish are kept when caught. When not in use, *haapee* are kept on dry land, lying on the ground, leaning against a tree, or set up on a frame. In shallow water, when bait or larger fish is being kept alive in them, they lie on the sand partially or wholly submerged. When carried out to the fishing grounds, they may be set in or across the canoe body, or on the outrigger supports, or they may be towed behind or alongside of the canoe. In deep water they will float beside the canoe, serving either as a container for small fry used for bait, or as receptacles for larger fish when caught.

The *hinai* (*hina'i*) described by Handy (14), and observed at Faaone, Tahiti, is a shrimp trap made of twine-woven *ieie*; a bottle-necked basket with two openings, one through the neck, and the other, funnel-shaped, through the bottom. When the *hinai* is employed in catching shrimps, coconut meat is placed inside as bait, the opening in the neck is closed, and the trap is placed in fresh water where shrimps are plentiful. These, attracted by the bait, enter the basket by the narrow funnel-shaped opening at the bottom, and once inside, are unable to find their way out again on account of the in-turned sides of the funnel which lead them to pass right over the opening as they move about inside. One informant, a young quarter-Tahitian living in Papeete, insisted that the *hinai* was brought to Tahiti from Rapa in recent times, but admitted at the same time that the *haapua,* described in the paragraph immediately following, was an old Tahitian form. Stokes (23) remarks that the *hinai* form is typical of Rapa, which may show that the above information, though from a source of doubtful value, may be correct. If, however, the *haapua* is an old Tahitian form—and my information leads me to believe that it is—it would seem that this holds true also of the *hinai,* for the two are distinctly complementary elements of a single equipment, as is indicated in the next paragraph. It is beyond question that twined weaving, such as is used in making the three types of shrimp baskets here described, is genuinely Tahitian.

Described by W. C. Handy (14, Pl. VII) and observed at Faaone, Tahiti, is a large container made of *ieie* twine-woven, having bulging sides and a small opening in the top which is closed when desired with a lid made in the same way as the basket and attached to it. The *haapua* serves as a container in which shrimps are kept after they have been caught in the *hinai* which has just been described. The transfer of the catch is accomplished by opening the lid of the *haapua,* then emptying the contents of the *hinai* into it by turning it upside down and thrusting the neck into the open

haapua. When the shrimps have all fallen or crawled into the latter, the *hinai* is withdrawn and the lid of the *haapua* is fastened down. The *haapua* is sometimes employed in carrying the large marine crawfish, but this is undoubtedly a fortuitous usage, for the *haapua* and the *hinai* represent complementary elements of the shrimp-catching equipment.

The *tavai* (14, Pl. VII) is a flat, deep, pliable basket with an oval opening, made of split *ieie* in open twine-work. This is employed in fishing for shrimps in shallow water. A woman will often use the front of her skirt, or a piece of dark cloth for the same purpose.

It is interesting, and perhaps significant ethnographically, that the three types of basket just described, and their use in fishing, seem to be peculiar to the Aharoa or northern region of Tahiti. The evidence on this point, however, is insufficient to justify a definite statement.

A great variety of baskets and basket-like traps and containers is used in connection with fishing. Examples of a number of these were observed in the course of our work throughout the group, and these are described by Handy (14).

An interesting form of trap called *faa* (*fa'a*) was observed in Punaauia, Tahiti (Pl. XXV, *C*). The rods which form the sides of this trap are guava sticks. At either end and in the middle are hoops each made of a bundle of twisted guava twigs the ends of which are brought round and bound together to make the circular hoop. On these hoops the rods are bound by means of *ieie* as shown in figure 19, *a*. In the intervening space between the

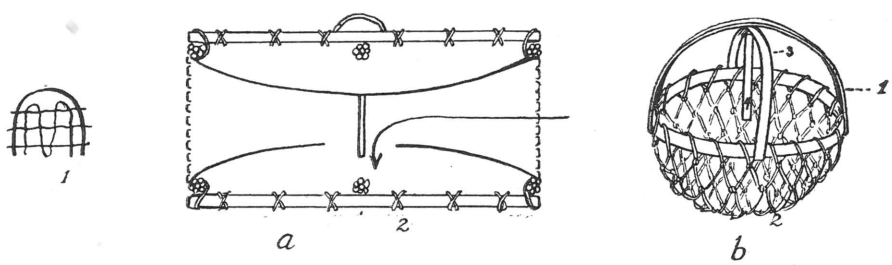


FIGURE 19.—Fishing apparatus: *a*, lobster trap (*fa'a*): 1, partition; 2, side of cross section of the trap; *b*, crab basket: 1, hoop; 2, netting; 3, handle; 4, pendent stick.

hoops, the rods forming the outside of the trap are further bound together by lashings of *ieie*. Between each of the hoops there are three such lashings running round the trap. Within either end there is a funnel-shaped closure made of *ieie* woven in large mesh. The small ends of the walls of these funnel-shaped entrances meet in the middle of the trap, and here there is inserted a little partition (*opani*) which stands at right angles to the funnel ends and prevents passage directly through the funnels (fig. 19, *a*, 1). This

little partition is made of *ieie* woven on a bent guava twig. Immediately below this partition there is a break in the walls of the funnels, giving access to the confining chambers of the trap. In the outer wall of the trap at one end there is a small opening, intended for emptying the catch. When the *faa* is under water this is closed by a little door (*opani*) made of *ieie*. The trap is carried by means of a handle (*tape*) of *ieie* attached to the top. When it is let down in deep water a rope is attached to this handle. The *faa* is employed for fishing in the deep water between the fringing and barrier reef. Bait is put inside, and in it are caught all kinds of fish, lobsters especially. The owner of traps examined at Punaauia said that they were an old Tahitian form, but a young informant in Papeete insisted that they were copies of an imported form of lobster crate.

What is known as a *papare upea* or *papare vairaia* (Pl. XXI, *A*) was observed at Tautira, Tahiti. The framework consists of light *purau* logs and poles, chosen on account of their buoyancy. The exact dimensions were not recorded, but the approximate length and breadth was about 12 by 8 feet. As shown in the photograph, there is on either side a large log running lengthwise. Resting on these at equal intervals are four slightly bowed crossbars. Upon the ends of these crossbars rest two smaller logs running lengthwise and parallel to the bottom logs, held in place by large spikes that are driven through the upper log, the crossbar, and into the lower log at each point of intersection of the three elements of the frame. A shallow net of medium-fine mesh is lashed inside the frame, being bound to the upper longitudinal logs and to the end crossbars by means of sennit and strips of *purau* bark. The *papare upea* is employed in the deep-water fishing with large nets, being carried out to the fishing grounds on several canoes and then put in the water. The size of the large bottom logs is such as to make the contrivance float with the shallow net slightly under the surface except for the sides and the ends which are bound to the upper part of the frame. The nets, as they are brought up with the hauls of fish, are emptied into the *papare* which, when full, is towed in to the beach by the canoes.

A basket net (*toto,* or *upea toto* or *upea parai*) was observed at Tevaitoa, Raiatea (Pl. XXIV, *A*). An orange or guava stick is bent to form a hoop about 2 feet in diameter. On this hoop is made a bag net with large mesh. Two cords tied to the hoop serve as handles to hold the net (corresponding to the wooden handles used in the Tahitian *tata* described in the next paragraph), and a third cord hangs down from the point of intersection of these, holding, when the net is in use, a baked breadfruit which serves as bait. To the bottom of the bag net is tied a stone which serves as a weight to submerge the contrivance and keep it upright. This form of net is used for catching fish, not crabs. Another form of bag net which is very similar to this was described to me on Raiatea. This is termed the *tata upai.* It has

a hoop approximately 3 feet in diameter and a net of the same depth, and is used in the same way as the *toto* just described. Land crabs (*tupa*) are put in the bottom of the net for bait and the contrivance is thrown into the water of the lagoon.

Figure 19, *b* shows the general form of crab baskets (*tata*) observed in the district of Faaa, Tahiti. The basket consists of a hoop (fig. 19, *b*, 1) of wood or metal to which is attached a shallow piece of netting (fig. 19, *b*, 2) with medium-fine mesh. To the hoop are attached two handles (fig. 19, *b*, 3) made of guava sticks bent in a semicircle and crossing each other at right angles. From the point of intersection of these sticks hangs down a straight stick (fig. 19, *b*, 4) the end of which is approximately on a level with the rim of the basket. This stick has radiating twigs at the top which are lashed to the handles where they intersect. Apparently the purpose of the pendant stick is to hold the bait that attracts the crabs (*paapaa*) into the basket when it is let down into shallow water. When not in use, large numbers of these *tata* may be seen hung on upright poles stuck in the bottom of the shallow lagoon. They serve to catch crabs for the Papeete market in these days, which suggests that as they are the instruments of a modern industry they may also be modern introductions themselves. The resemblance of the *tata*, however, to the Raratean *toto* and *tata* just described—which are undoubtedly genuinely native—would seem to indicate that it is an old Tahitian form.

MISCELLANEOUS CONTRIVANCES

An interesting contrivance termed *fee* assists in octopus (*fee*) catching (Pl. XXIV, *B*). From a stick of bamboo termed *ofe* (fig. 16, *d*, 1) 31 inches long hangs a cord (*taura*) 33 inches long, to which is attached the object that attracts the attention of the octopus under water. This consists of a large egg-shaped assortment of bright pieces of cowry shell which overlap one another, being lashed on one end of a small pointed stick 14 inches long (fig. 16, *d*, 3). This part of the apparatus, including stick and shell, is termed *poreho*. The larger plates of shell are dark-brown in color, while the smaller cowries shown on the outer end in the plate are light colored. The *poreho* is said to have an oscillating rotary motion under water when the *fee* is in service. This causes the sunlight to glint on the bright shell, attracting the octopus, which reaches out of his hole in the reef, wrapping first one arm, then another around the *poreho* until he is sufficiently exposed to be speared and dragged out of his hole by main force. The bamboo serves as a float and also prevents the loss of the apparatus in case the octopus wins the battle and pulls the *poreho* into his hole instead of being pulled out of it himself.

The *haapee nape* or *aia* (*aya*), an example of which was observed at Faaone, Tahiti, is used for catching *nape*, which is described as being about the

same size as, and much like the mullet (*tehu*). As a contrivance it is also very similar to the *poito* which was employed in catching the mullet. The main part of the *aia* consists of a notched stick of *purau* wood (fig. 15, *d*) that is about 8 inches long. Resting in a groove at the lower end of this is a small stick of orange wood (fig. 15, *d*, 2) which is bowed back and held in place by cords passing around the notched stick as shown in the figure. At either end of the orange-wood stick hangs a small hook suspended on a short string (fig. 15, *d*, 3). To the upper end of the central notched stick is attached a cord. When used in fishing the *aia* bowed stick of orange wood is slipped right out of the groove that retains it, and its string is twisted off the central stick. Then a whole baked breadfruit, with core and rind removed, is put on the central stick, which is thrust downward through the hole left in the breadfruit by the removal of the core. The orange-wood bow is now replaced, and on either hook is put a piece of hard-cooked breadfruit. When the *aia* is thrown in the water, the cord coming from the upper end of the contrivance is held by the fisher, who, watching the bobbing of the breadfruit as the fish nibble at it, knows he has a bite when one or the other end of the bow is jerked into an upright position.

Albacore Crane

An elaborate outfit is employed for *aahi* fishing. This consists of two fishing canoe hulls lashed about 3 feet apart and held by two crossbars carrying between them a large basket used for small fry, for bait, and having at the forward end a long crane-like pole extending out over the water. The whole outfit is referred to as *tira*, though this word, which literally means "mast," specifically refers to the projecting pole. The two stout crosspieces of *purau*, termed *iato*, lashed to the gunwales at the points where there are the holes that normally receive the outrigger lashings, hold together the two fishing canoe hulls, whose outriggers have been removed. From the forward crosspiece (*iato i mua*) extends the crane, which is made in the following way: A small stick of ironwood (*aito*) 3 feet long, termed the *mau ri'o*, is lashed to the end of a *purau* pole about 12 feet long by means of braided sennit seizing (fig. 20, *a*, *b*, *d*, 1). The long *purau* pole (*pu*) which is the shaft of the fishing pole, is lashed to the upper end by means of three seizings of sennit (fig. 20, *a*, *b*, *c*, 2). A smaller section of *purau* (*tairi mua*) is bent in the shape shown in the figure, and forks at the end. The forks are termed *homaa*. The crane as a whole is spoken of as the *purau*. In Tahiti a single pole served for the *pu* and the *tairi*, but in Maupiti a separate small piece is used for the latter because it is frequently broken and suitable wood is scarce on this tiny island. The ironwood crosspiece (*mau ri'o*) at the base of the crane is held on the forward crosspiece by means of loose lashings, which allow it free play as the rod is elevated or lowered. The crane is

steadied by two stays (*taura hia*) which are attached to the ends of the cross-piece (fig. 20, *a*, 3). To the crane at its topmost point (fig. 20, *a*, *b*, 4) is attached another line, the *taura tuu rowa,* which runs back to the stern of the craft where it is held by the man that raises and lowers the crane. From either fork (*homaa*) at the end of the crane or fishing rod there hang three

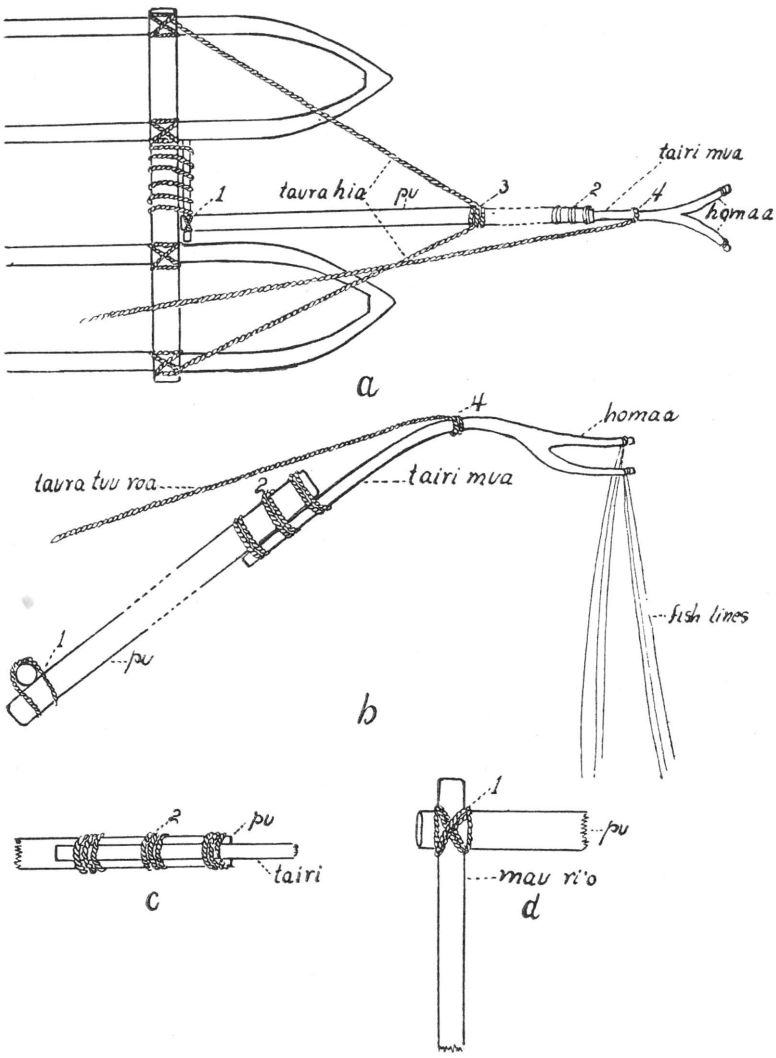


FIGURE 20.—Albacore crane (*tira*) as described on Maupiti: *a*, top view; *b*, side; *c*, attachment of fork (*homaa*) to pole (*pu*); *d*, attachment of pole (*pu*) to pivot (*mau ri'o*): 1, lashing of pole to pivot; 2, lashing of fork to pole; 3, lashing of stays to pole; 4, lashing of pulling rope to fork.

lines, just long enough to allow the hooks to skim the water's surface when the crane is projecting forward at an angle. Pearl-shell hooks (*parua*) of the kind used in bonito fishing are employed. On Maupiti, the lines, which were formerly always made of *nape,* are now frequently made of commercial twine; if made of sennit, they were termed *rowa,* which elsewhere is the term applied to another kind of cord. Lines are frequently broken and hooks lost. Hence it is that three lines are hung from each *homaa*—when one is broken it is hauled back, repaired, and a new hook is put on, while fishing with the others proceeds without interruption. Such provision is necessary because success in *aahi* fishing depends entirely on the ability of the canoe to follow up a school of *aahi*; a canoe that had to stop ten minutes to repair its line would be out of the running entirely.

Between the canoe hulls and the crosspieces is lashed a *haapee aanuwhe,* a great basket intended for carrying the bait and for holding the fish as they are caught. The forward end of the basket is attached to the forward crosspiece, while the after end is held up by a crosspiece on the basket itself which rests on the gunwales of the canoe. When the canoe puts out, the basket contains small fry for bait, mostly the little silver fish (*ouma*) which feed off the shore and beaches and are caught in great quantities by means of the *rau ere.* When the school of *aahi* is reached the *ouma* are taken out and cast about on the water ahead of the canoe to attract the *aahi* as the canoe paddles on following the school. The pearl-shell hooks skimming the water evidently resemble—to the *aahi* at least—the small fry, for they are snapped up by the big fish. As they are caught the crane is hauled up and drawn back so that the fish hangs over the basket; the fish is removed and put in the basket; and the crane is again let down. Meanwhile the canoe has been following steadily on with the school. The sport is said to be very exciting, in fact this was and still is, one of the most highly enjoyed pastimes of chiefs and others in these islands. In Maupiti I was told that *aahi* fishing is carried on in that island all the year around, but in Tahiti the season for *aahi* is from October to March. In both Tahiti and the leeward islands I was told that this type of fishing is confined to the leeward sides of the islands, because on the windward sides the sea runs too high. The *tira* can be used only in smooth water.

According to Ellis (10, vol. 1, pp. 148-9), bunches of feathers used to be tied to the extremities of the forks of the *tira,* "to resemble the aquatic birds which follow the course of the small fish, and often pounce down and divide the prey which the large ones pursue." As bonito are supposed to follow the course of the birds, as much as that of the fishes, when the fishermen perceive the birds, they proceed to the place, and usually find the fish. That is to say, it was supposed that the feather pieces on the *tira* would attract the large fish, for these were believed to keep an eye on the

birds hovering above schools of the small fish which were the prey alike of the birds and the *aahi*.

In the construction of the *haapee aanuwhe* (Pl. XXV, *A*), a frame is made, consisting of two rounded sideboards (fig. 21, *a*) and a bottom-board (fig. 21 *b*) made of breadfruit wood, which are held in place by ribs made of guava wood, and by crosspieces on top. The guava sticks that serve as ribs are bound to the side and bottom-boards as shown in figure 21, *c*: a continuous cord of three-ply *nape* runs the length of the board,

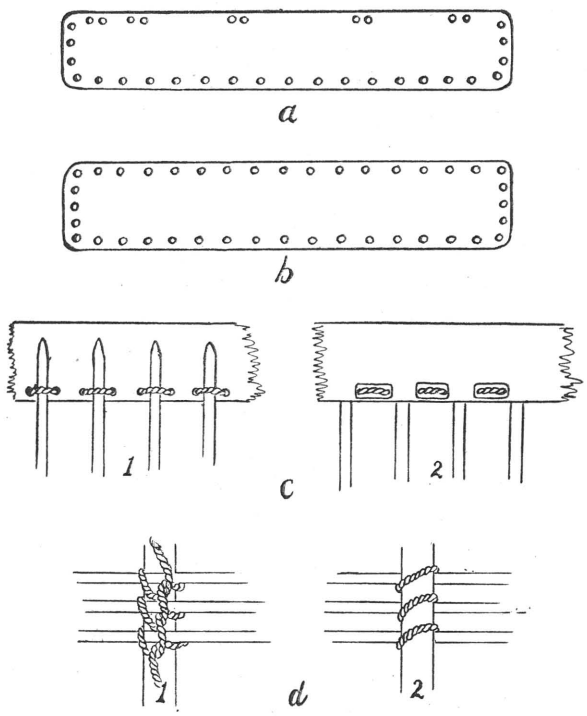


FIGURE 21.—Details of *haapee aanuhe*: *a*, sideboard; *b*, bottom-board; *c*, attachment of ribs to sideboard: 1, inside; 2, outside; *d*, lashing of fern stalks to ribs: 1, outside; 2, inside.

passing in a hole, over the end of the rib, out through the next hole, along through a short groove that connects the latter with the next hole; in the next hole, over the next rib, and so on for the length of the board. The passage of the cord within the groove on the outside prevents its being worn or broken when the heavy basket is dragged on the beach. On the outside of the ribs, running lengthwise, are bound stems of staghorn fern (*aanuwhe*), forming sieve-like sides to the basket. By means of *anave* fern stems are lashed in bundles of three (fig. 21, *d*). Semicircular ribs held in

place by braces form the frame at either end. After passing over these the fern stems are turned back and brought to the top crosspieces at either end of the frame. The fern stems making the deck-like covering at either end are held together by cord lashings running across as shown in the plate. The holes observable in the upper margin of the sideboard showing in the plate, and in the broad crosspiece at one end, would seem to indicate that a lid of some kind was used with this *haapee*. There was no lid, however, belonging to the specimen examined and photographed at Maupiti—the only *haapee* of this type found in the islands—and, unfortunately, I failed to inquire into the matter. The dimensions of this *haapee* were: length, 52 inches; width, 26 inches; depth, 20 inches. The general term used for this was *haapee aanuwhe*; but one man on Maupiti called it *erevai*. The people of Maupiti are also acquainted with the bamboo *haapee*.

In Tahiti I have seen a small model of the *haapee aanuwhe*. The following quotation from Ellis (10, vol, 1, pp. 147-8) proves that these were in use in Tahiti in early times. In describing the native's manner of fishing for large fish with the *tira* he says: "Between the fore-part of the canoes, a broad, deep, oblong kind of basket is constructed, with the stalks of a strong kind of fern, interwoven with the tough fibers of the *ieie* . . . "

Rau Ere

The *rau* (*rau ere* or *rau ere haari taviri*), which is a long heavy garland made of coconut leaves, is employed for drag-fishing in the shallows of the fringing reef. The *rau* (literally "leaf") is made in the following way: Quantities of green coconut leaves having been collected, the narrow strips (*niau*) to which the leaflets attach on either side of the stem are split off and the heavy stem is discarded. Two men then stand facing each other, each holding 10 of the detached strips of coconut leaf with leaflets attached. Together they twist (*tavari*) the two bundles of ten leaves around each other. A large number of sections for the *rau* having been prepared in this rough manner, they are all bound together end to end by means of strips of *niau* wrapped about the points of intersection so that there will be no gaps in the continuity of the fringe. Then along the whole length of the *rau* is bound a heavy band of *more,* or inner bark of the *purau* tree, which is passed around the bundled *niau* at short intervals with a half hitch and serves to bind these together. As it runs the whole length of the *rau,* it gives the required tensile strength to this very heavy garland that is to be drawn through the water, and which sometimes brings in among other fish a small shark.

A number of people are required when the *rau* is used. One end of the cumbersome apparatus is towed out around the area of lagoon that is to be swept, by men and women swimming and walking, and dragging the *rau* around the area in which the fish are to be trapped. Gradually the end is

drawn to the shore, and then a small area of the lagoon is completely enclosed by the semi-submerged *rau*. Gradually men and women stationed at intervals around the length of the *rau* in the water, and those on shore, draw in towards the shore. Some fish are speared, caught with hand nets, or even in the hand as the *rau* approaches the beach, frightening before it the fish confined in its area. But the greater proportion of the fish caught by this method are those that attempt to escape by darting through the tangled *rau*. These come up in the *rau* as it comes in the shallow water and on the beach and are grabbed eagerly by the fishers, who throw them into canoes or up on the shore. The most favorable time and place for using the *rau* is about the mouth of a stream following rains, when fish have been attracted into the shallow water in large numbers by the food brought down out of the valleys by the flood waters. A shallow net of great length and fine mesh is often used for the same purpose and in the same manner as the *rau*.

An interesting account of a type of lagoon fishing practiced at Borabora, which makes use of the *rau ere,* is given by M. J. L. Bouge, Governor of Tahiti, in whose honor a *Tautai taora ofai* (fishing by throwing stones) was staged (3). A fleet of canoes formed a semicircle extending from Toopua islet to the barrier reef. While the fleet advanced slowly, men stationed on the bows of the canoes threw into the water heavy stones attached to short lengths of rope, which were repeatedly drawn up to be thrown in again and again. Frightened fish were thus driven towards a closed basin with a narrow opening. Extending fanwise from either side of the opening was a *rau ere,* handled by women. As the fish were driven close to the opening, the women with the *rau ere* closed in on them and swept them into the basin, where they were imprisoned.

Rafts

The following, quoted by Ellis (10, vol. 1, pp. 139-40) describes a unique method of fishing:

> They have a singular mode of taking a remarkably timorous fish, which is called *au* or needle, on account of its long sharp head. The fishermen build a number of rafts, which they call *motoi*; each raft is about 15 or 20 feet long, and six or eight wide, and it is made with the light branches of the hibiscus or purau. At one side a kind of fence or screen is raised four or five feet, by fixing the poles horizontally, one above the other, and fastening them to upright sticks, placed at short distances along the raft. Twenty or thirty of these rafts are often employed at the same time. The men on the raft go out at a distance from each other, enclosing a large space of water, having the raised part or frame on the outside. They gradually approach each other till the rafts join, and form a connected circle in some shallow part of the lake (lagoon). One or two persons then go in a small canoe towards the center of the enclosed space, with long white sticks, which they strike in the water with a great noise, and by this means drive the fish towards the rafts. On approaching these, the fish dart out of the water, and in attempting to spring over the raft, strike against the raised fence on the outside, and fall on the surface of the horizontal part, when they are gathered into baskets, or

canoes, on the outside. In this manner, great numbers of these and other kinds of fish, that are accustomed to spring out of the water when alarmed or pursued, are taken with facility.

Swordfish are sometimes captured as a result of their attacking a boat or canoe. The fish attacks a boat or canoe and his sword pierces and is held fast in the hull of a canoe. Canoe and fish are then dragged ashore, or a man leaps overboard and places a noose over the captive's tail. It is at night that swordfish are likely to make such an attack, no doubt mistaking the boat bottom for a larger fish.

Sharks are also caught with a noosed rope. A piece of meat attracts them alongside a canoe and the noose is held so that the beast swims into it. Tyerman (26, p. 315) was eyewitness to the capture of a shark that attacked their boat. A brave native grabbed the shark by the fin, holding him back while others caught the floundering tail. It was then secured by a rope round its belly, hauled into the canoe, and dispatched with clubs and stones. It is said—with how much veracity I cannot say—that a man will sometimes dive and put a noose over the tail of an unwary shark. A rope noose may also be employed when a shark has been speared with a heavy, single-pointed, barbed spear, or when it takes a hook, the rope or noose serving to tow the body or lift it into the boat after it has been killed with a spear or knife. In the days of wooden fishhooks, enormous hooks made of a bent or crotched stick were used without bait for catching sharks; now the largest sizes of steel and iron hooks sold commercially are used, with a chunk of meat attached as bait. Sharks were also caught by means of very coarse net made of twisted bast woven in large mesh.

Whales (*tohora*) are sometimes stranded on the reefs, where they are attacked by all the fishermen in the vicinity with their heavy *patia*. Sometimes the whale is dispatched; but occasionally, too, there is another end of the sport, which is by no means lacking in danger for those engaged in it. An amusing tale is told at Faatoai, Moorea, where a whale was a few years ago stranded on the reef by the pass into the lagoon. The natives who had paddled out to help dispatch him had gotten out of their canoes to secure a firmer foothold on the reef; and one, supposing the prey to be fast on the reef, had tied his canoe to a spear thrust into the side of the beast. Events took a turn in an unexpected direction and the whale suddenly succeeded in extricating himself. Once in the deep water of the pass he lost no time in making for the open sea. When last seen he was proceeding at full speed on an eastward course with the spear handle still out of the water and the fishing canoe in tow. The tail of a stranded whale sometimes creates great havoc among the canoes of those attacking him.

The ray (*fai*) is harpooned by means of a spear with rope attached to

the shaft. This, too, is a dangerous sport when it is a large ray. Turtles (*honu*) are caught by means of hook and line.

Torches

For night fishing torches (*rama*) are made either of bundles of dry papyrus (*aeho*) stems, or of bundles of crushed dry bamboos. The use of *rama* in fishing for fresh-water eels, and on certain nights for flying fish caught with lading nets at sea has already been mentioned. Torches are also used on the reefs at night, particularly when the *totara* is hunted with the spear (8, vol. 1, pp. 149-50). Various other kinds of fish are also attracted by the light of the torch, both in the lagoons and in the relatively shallow water on the reefs.

FLYING FISH AND DOLPHINS

There were several methods that were especially used in catching flying fish (*manana*). These fish swim or float on the surface in great numbers on certain nights, and at these times they are fished for by torchlight and with a landing net on the end of a long pole, described on pages 88-89. Another way of obtaining the *manana* is described by Wilson (31, p. 384) as follows:

> While the dolphin fishery lasts, numbers of large flying fish are caught by the following means: a number of small white sticks, 6 or 8 feet long, are prepared, and weighted with a stone to keep them erect in the water, to each of these they fix a short line and a hook of bone baited with cocoa-nut kernel. These they cast out into the sea as they are standing off at a distance from each other, and taking them up at their return, generally find a fish at every hook; so that if they have no success at the dolphin fishery, they do not return empty-handed; and sometimes bring in sharks and other fish.

The following, concerning the dolphin fishery, is from the account of the visit of the ship *Duff* to Tahiti (31, pp. 383-4).

> For the dolphin they fish in sailing canoes, at 4 or 5 miles distance from the land. They never put out a line till they discover a fish, when they make sure of it, as they bait with flying-fish prepared for that purpose. When the dolphin is hooked they play him till spent, when they bring him alongside by degrees, and lay hold on the tail, by which they lift him in, never depending on the hook and line. When they have got to the fishing ground they ply to windward. About fifty or sixty canoes from Matavai are employed in this fishery during the season.

POISONING AND DYNAMITING

Poisoning is a favorite mode of securing fish about the reefs and lagoons. The deadly fruit of the *hutu* tree is most commonly employed for this purpose, being mashed up and scattered around in the vicinity of the holes frequented by fish. The fish are apparently killed by the poison diffused in the sea water, and rise to the surface dead, but with their flesh unaffected by the poison. The leaves of the *hora* and several other plants having poisonous

foliage—Forster speaks of *oao,* which he identifies as *Daphne foetida,* and *enou*—identified as *Lepidium piscidium*—are used for the same purpose. Bait was evidently sometimes impregnated with the poison, and then scattered about. In mentioning this usage Forster wrote (12, pp. 462-3): "They make use of several plants and fruits, which when bruised and mixed with some minced meat of shell or crayfish and thrown into the sea inebriate the fish to such a degree, that they may be caught by the hands."

The setting off of a charge beneath the surface of the water, causing a percussion which kills all of the fish in the neighborhood, was formerly a common practice. It was a dangerous method for the unskilled manipulator; and, so far as the fishery was concerned, disastrous, for it exterminated everything in the range of the shock. It is fortunately forbidden by law at the present time.

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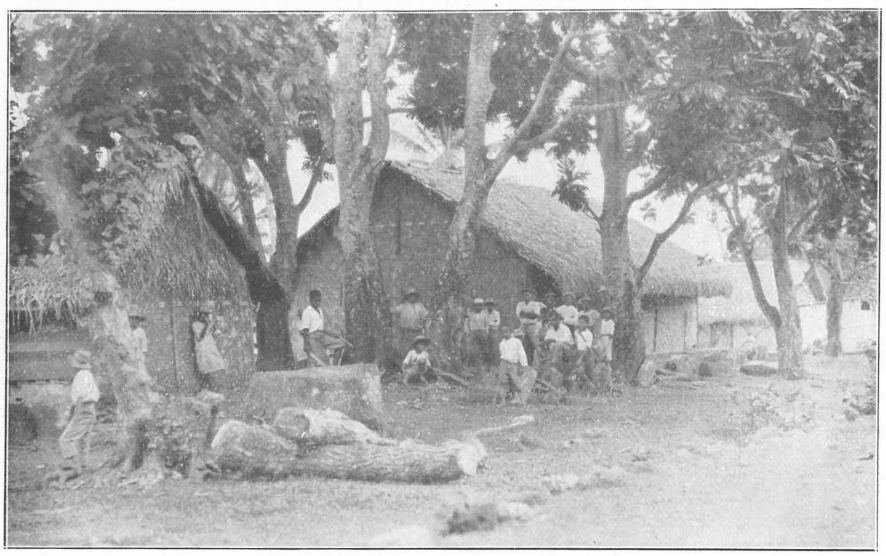
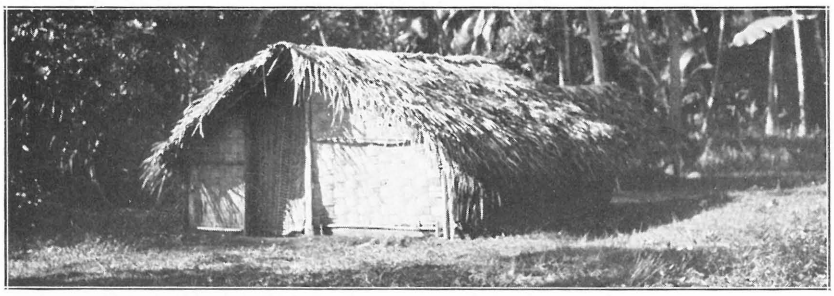


A

B

HOUSE FOUNDATIONS: *A*, ANCIENT SITE OF CHIEF'S HOUSE, TEVAITOA, RAIATEA; *B*, HOUSE TERRACE, APOOTAATA, MOOREA.

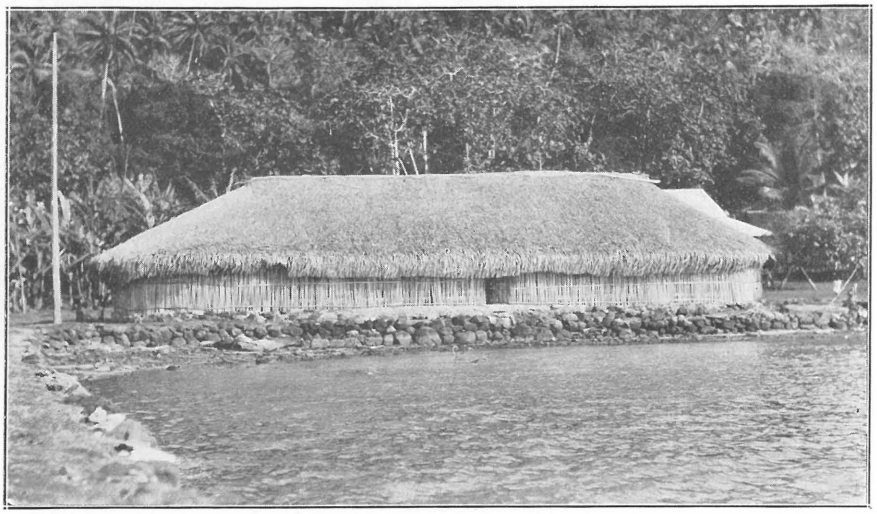
A



B

C

FARE HAU PAPE: *A*, FRAME AND DWELLING WITH DOOR IN THE SIDE WALL; *B*, WITH WALLS OF WOVEN BAMBOO, AND COCONUT MAT DOOR, HAAPAPE, TAHITI; *C*, WITH DOOR IN END AND WALLS MADE WITH PURAU ROD LATTICE, PAEA, TAHITI.



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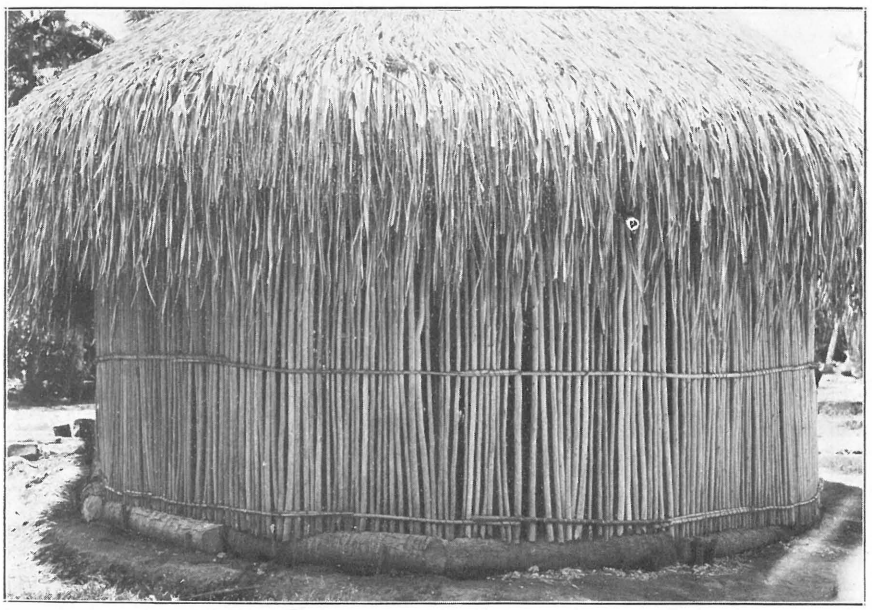
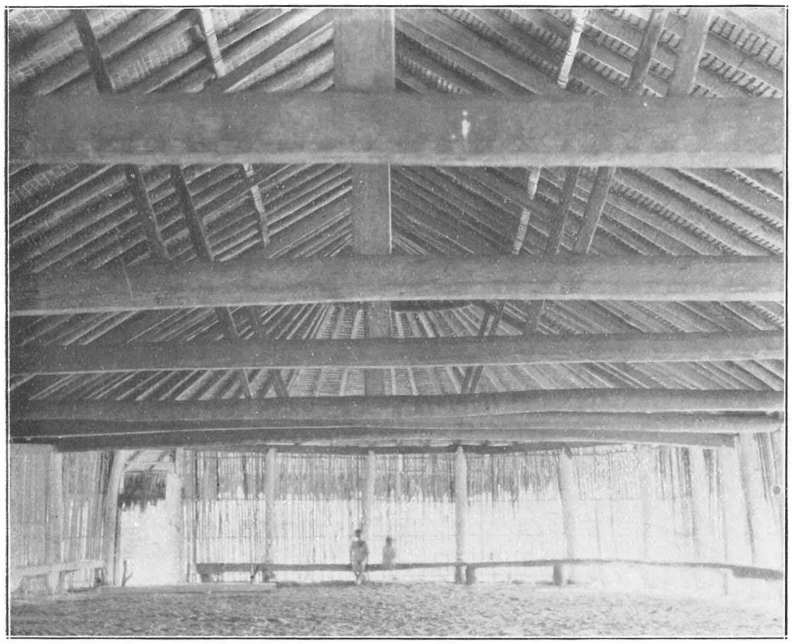


B

EXTERIORS OF FARE POTEE: *A*, AT VAIEA, MAUPITI, SIDE VIEW, TOTAL LENGTH INSIDE, 91 FEET 9 INCHES; LENGTH OF TINO FARE (THE STRAIGHT SIDES, OMITTING THE ROUND ENDS WHICH ARE APPROXIMATELY 20 FEET, 6 INCHES DEEP) 50 FEET, 9 INCHES; WIDTH INSIDE FROM WALL TO WALL, 18 FEET, 5 INCHES; HEIGHT OF PLATE FROM FLOOR INSIDE, 8 FEET, 2 INCHES; ELEVATION OF THE RIDGEPOLE ABOVE THE FLOOR, 17 FEET, 10 INCHES; *B*, AT ANAU, BORABORA, END VIEW.



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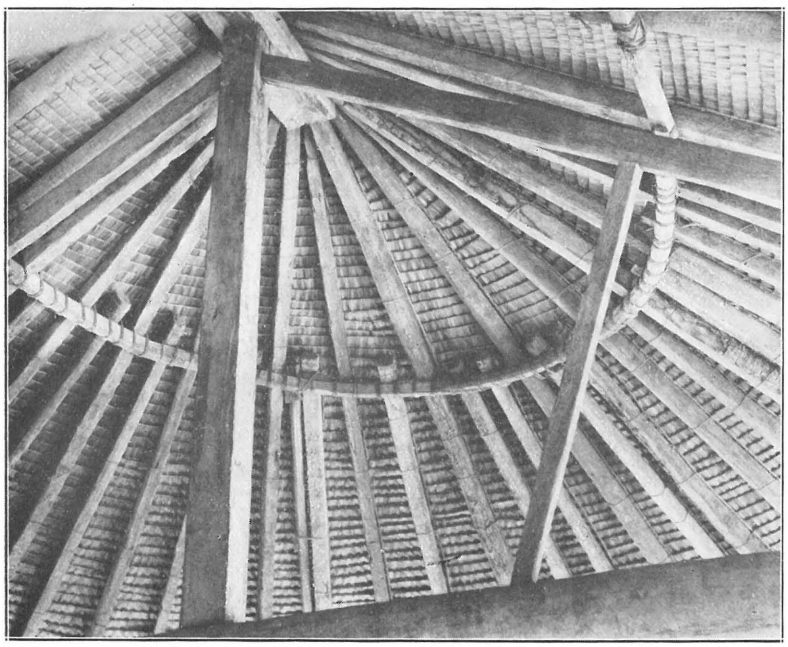
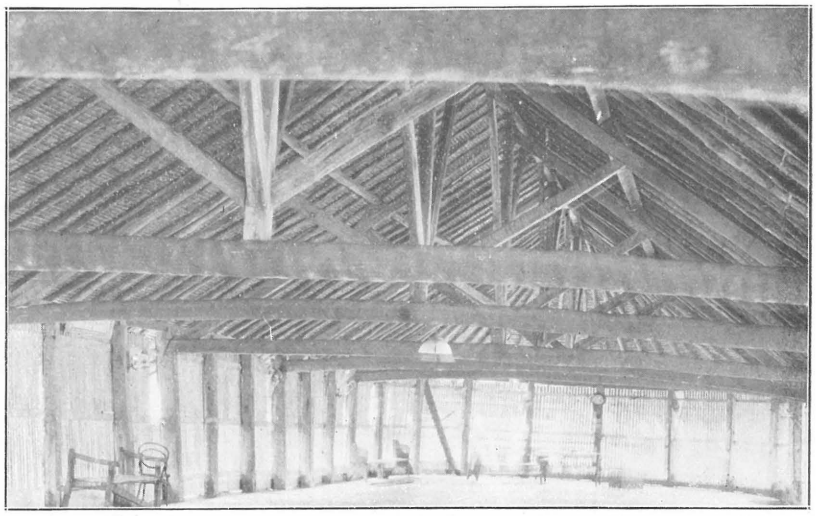


B

INTERIOR OF FARE POTEE AT VAIEA, MAUPITI: *A*, END; *B*, ROOF.



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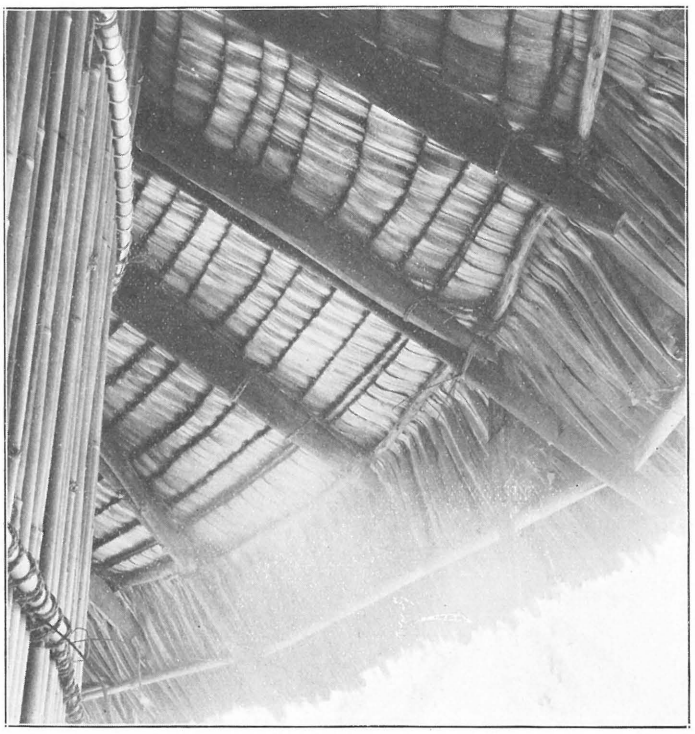


A

DETAILS OF FARE POTEE: *A*, INTERIOR OF ASSEMBLY HOUSE AT VAITAPE, BORABORA; *B*, EAVES OF HOUSE AT FAANUI, BORABORA.

A

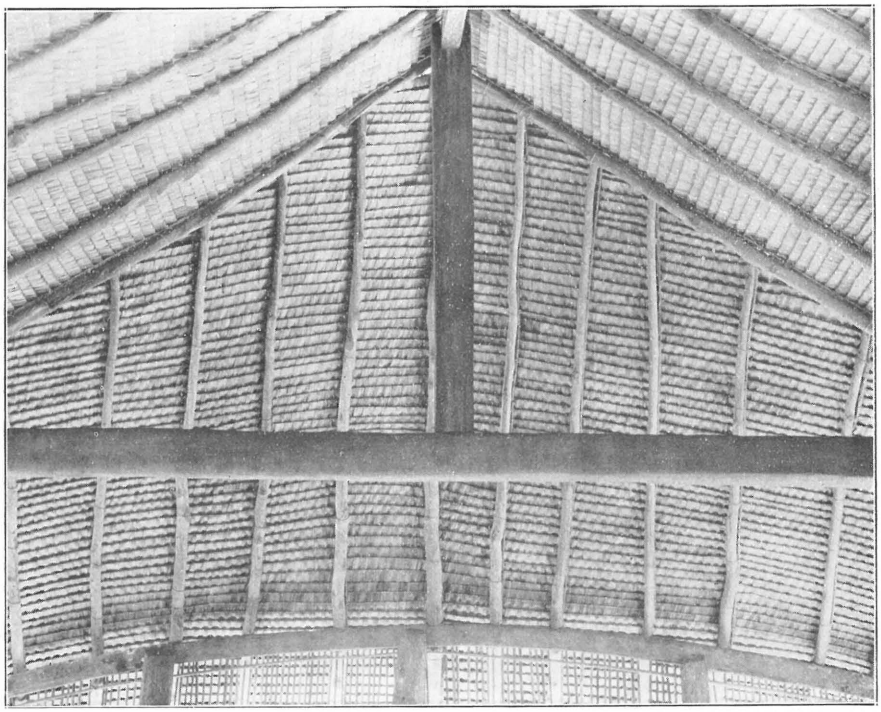
B

FARE TAUPEE: *A*, AT ANAU, BORABORA; *B*, FRAME AT HAAMENE, TAHAA.

A

B

EXTERIOR OF MAUPITI FARE TAUPEE: *A*, END; *B*, FRONT. LENGTH INSIDE, 32 FEET, 2 INCHES; LENGTH OF SLOPING END SECTION (TAUPEE) 7 FEET, 2 INCHES; LENGTH OF SIDE PLATES AND RIDGEPOLE (EQUALS LENGTH OF THE BODY OF THE HOUSE), 18 FEET, 2 INCHES; WIDTH INSIDE, 16 FEET, 8 INCHES; HEIGHT OF END PLATE FROM GROUND AT MIDDLE END POST, 5 FEET, 10 INCHES; HEIGHT OF END PLATE FROM GROUND AT CORNER END POST, 4 FEET, 5 INCHES; ELEVATION OF FLOOR ABOVE PAEPAE, 1 FOOT, 9 INCHES; HEIGHT OF SIDE PLATE ABOVE GROUND LEVEL, 7 FEET, 7 INCHES; FROM FLOOR TO CROSSBEAM AT ITS MIDDLE POINT, 5 FEET, 6 INCHES; THICKNESS OF CROSSBEAM, 9 INCHES; HEIGHT OF POST SUPPORTING RIDGEPOLE, 6 FEET, 5 INCHES; EXTENSION OF EAVES BEYOND WALLS, 2 FEET, 3 INCHES.



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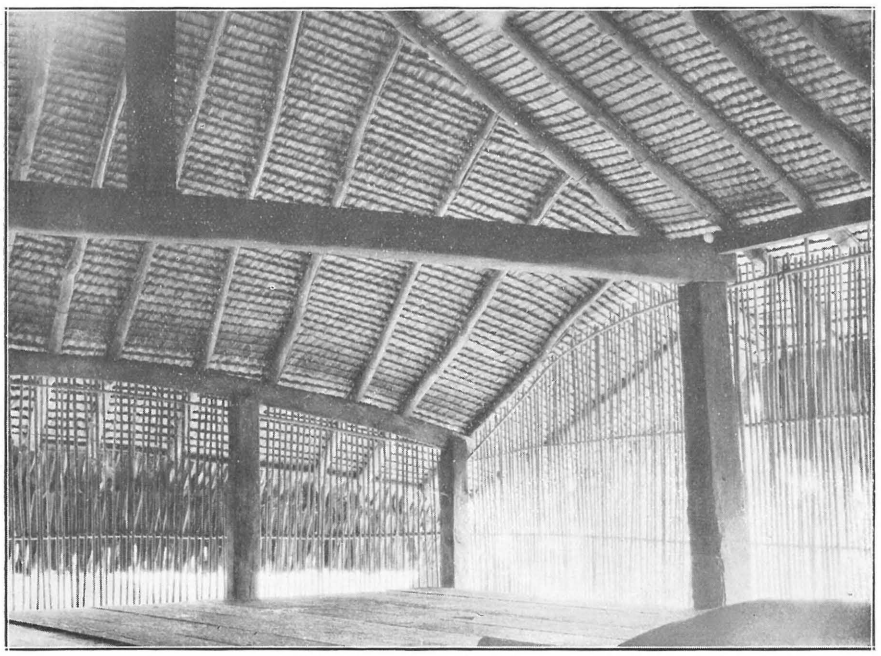
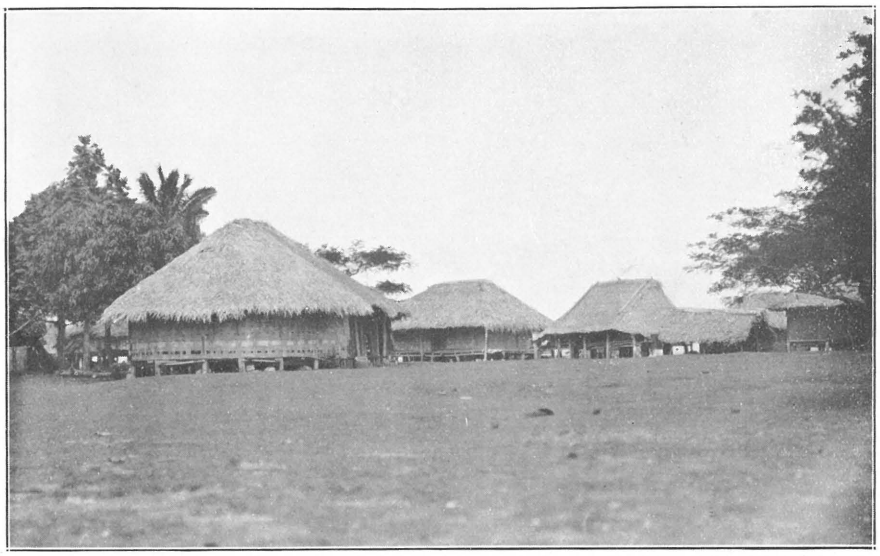


B

INTERIOR OF MAUPITI FARE TAUPEE: *A*, SIDE AND END ROOFING; *B*, SIDE AND END WALLING.



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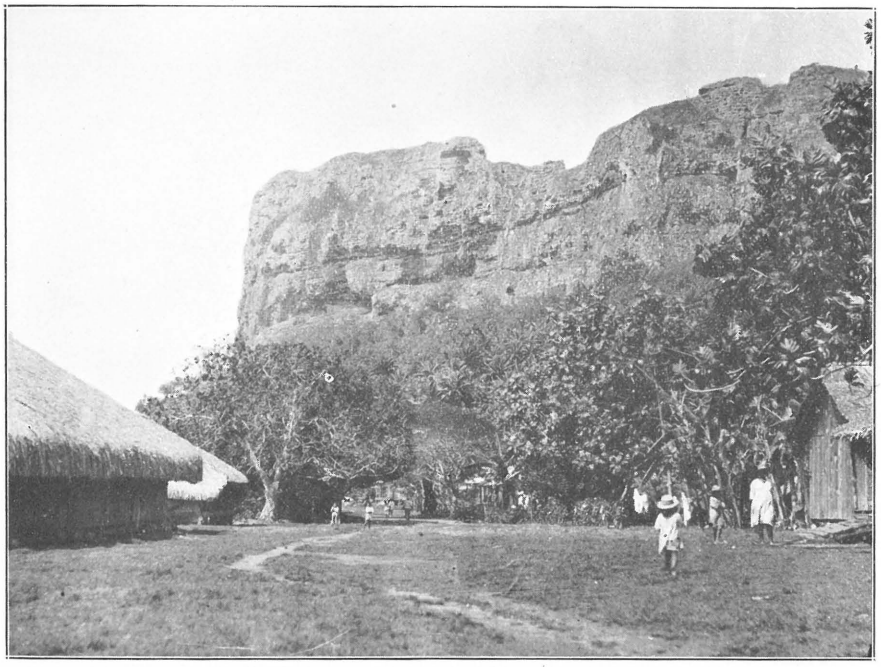
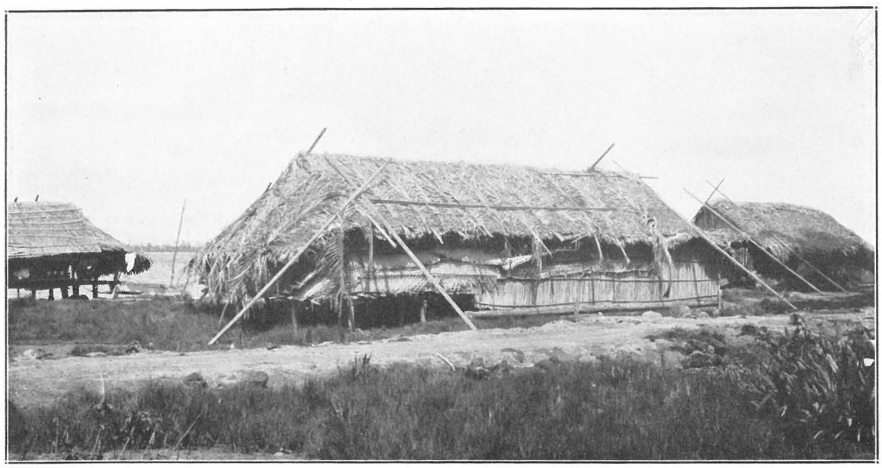


B

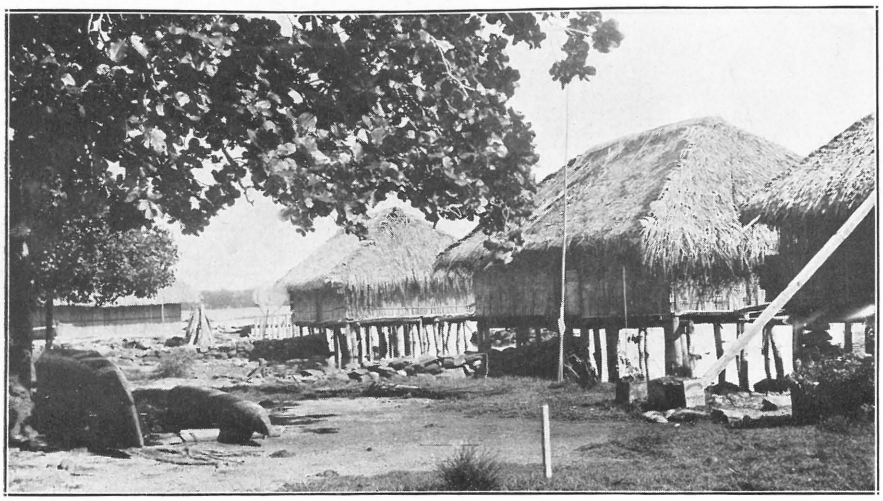
VILLAGES OF THE LEEWARD ISLANDS: *A*, TEVAITOA, RAIATEA; *B*, VAIEA, MAUPITI.



A

B

HOUSE FORMS OF THE LEEWARD ISLANDS: *A*, FARE TAUPEE AT ANAU, BORABORA, WITH SLEEPING QUARTERS AT ONE END HAVING A RAISED FLOOR, AND KITCHEN AT GROUND LEVEL OCCUPYING THE OTHER END; *B*, FRAME OF FARE TAUPEE WITH FLAT END ROOFS, AT HOTOPUU, RAIATEA, SHOWING FRAME OF SEPARATE FLOOR PLATFORM SUPPORTED ON PILES.



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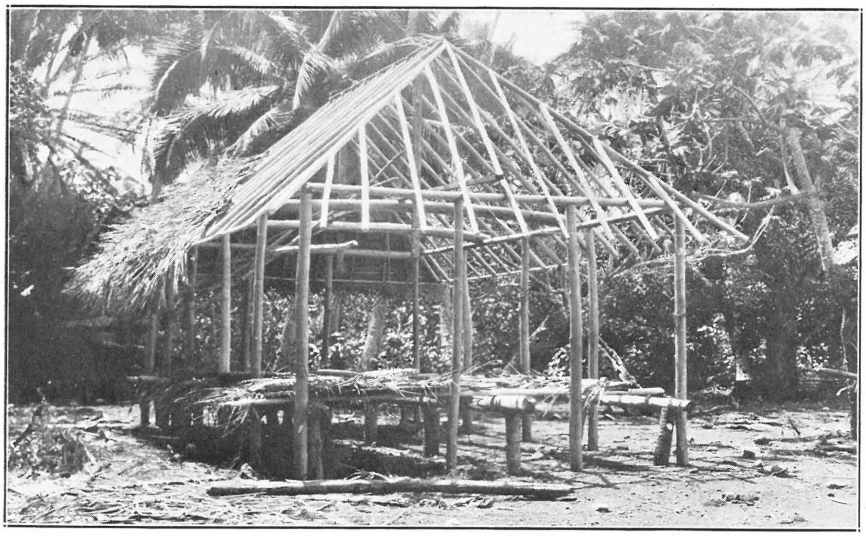
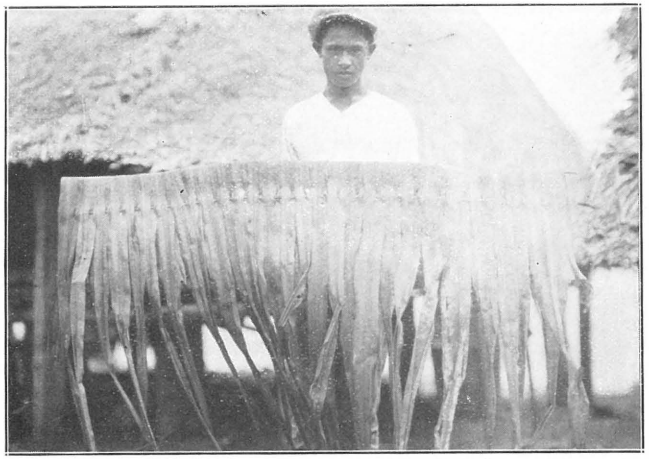


B

FARE TAUPEE WITH FLAT END ROOFS: *A*, AT THE VILLAGE OF MAEVA, HUAHINE; *B*, HOUSE IN PROCESS OF CONSTRUCTION AT MAROE, HUAHINE.

A

B



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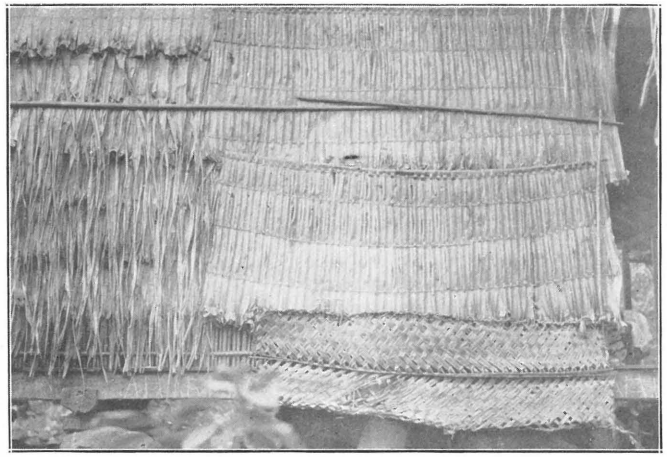
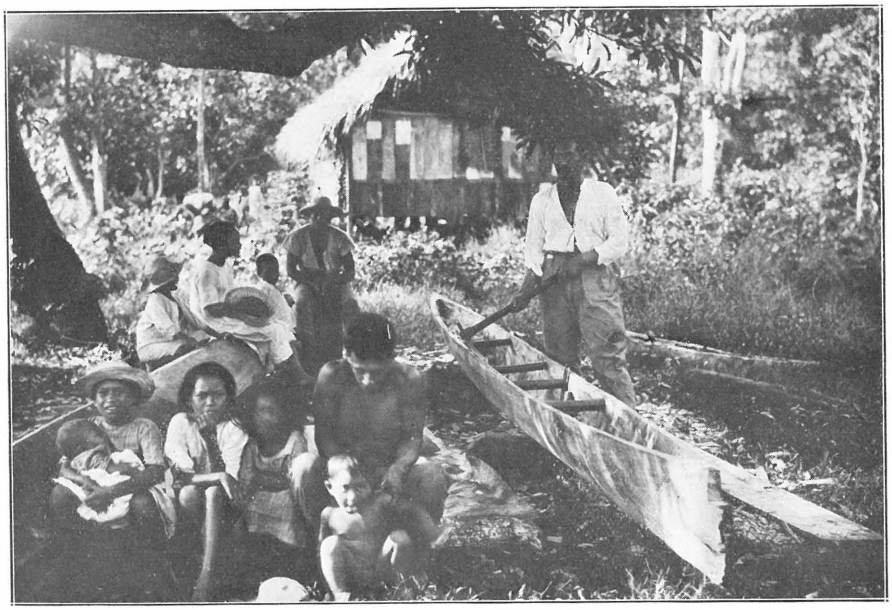


D

MAT-THATCHING PROCESS: *A*, PANDANUS LEAVES READY FOR FLATTENING, HUNG UP TO DRY AFTER SOAKING IN SEA WATER; *B*, LEAVES FLATTENED AND TIED IN ROLLS; *C*, LEAVES DOUBLED OVER STICK AND PINNED WITH BAMBOO, COMPLETING PANDANUS THATCH MAT ELEMENT (RAU ORO); *D*, SEVERAL TYPES OF PANDANUS MATS, AND A COCONUT-LEAF MAT USED FOR WALLING ON MAUPITI.

A

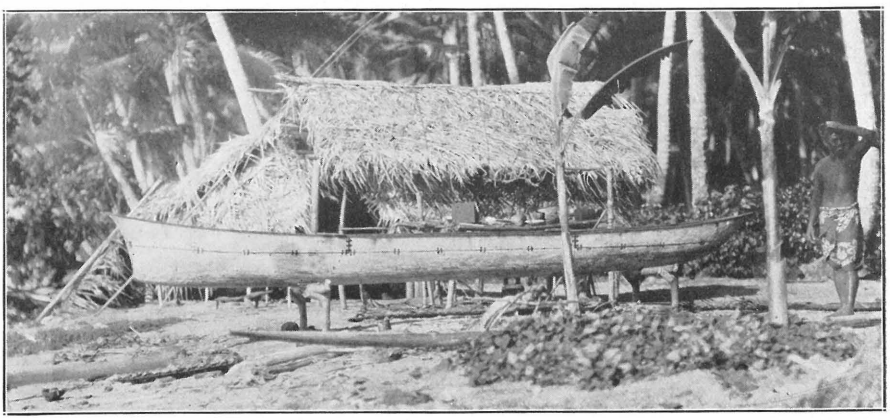


B

ADZING SMALL CANOE HULL: *A*, FINISHING THE BOTTOM; *B*, VIEW FROM ABOVE, SHOWING BRACES TO PREVENT WARPING.

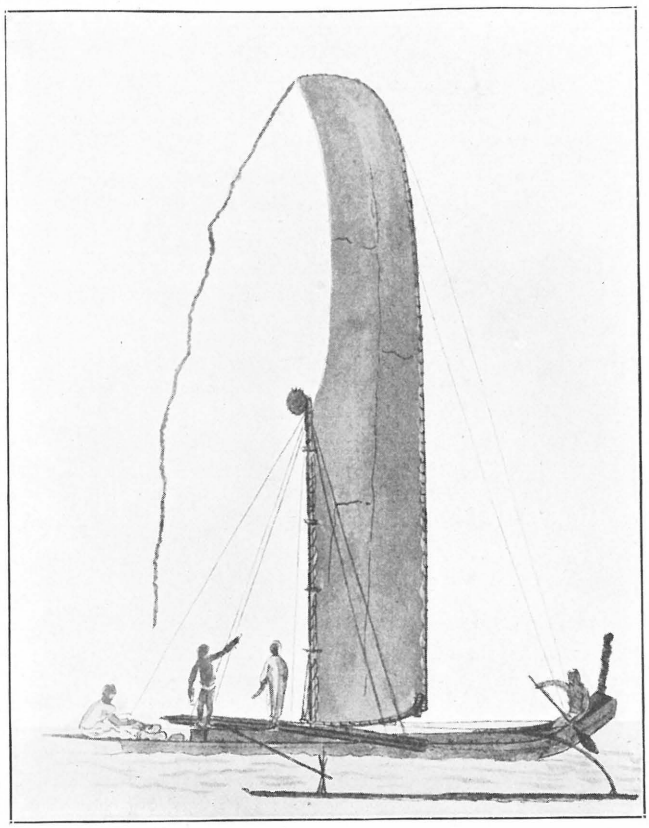
A

B



C

BUILT-UP CANOE OF THE LEEWARD ISLANDS: *A*, ROUGHED OUT BOTTOM *B*, FINISHED BOTTOM; *C*, COMPLETE HULL, WITH SIDEBOARDS, BOW, AND STERN PIECES SEWN ON WITH SENNIT.



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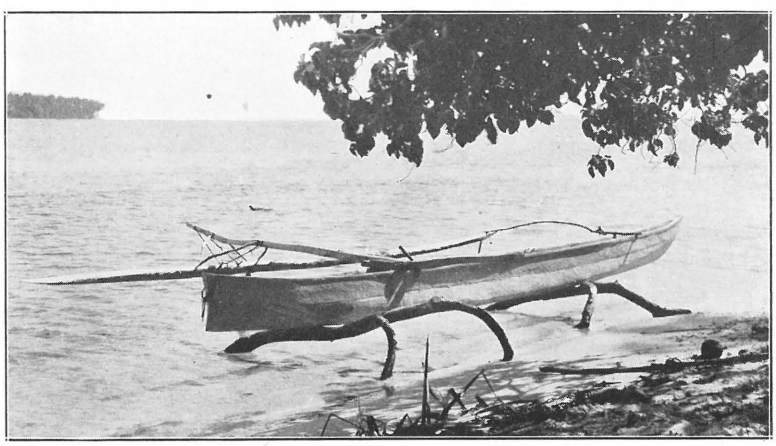
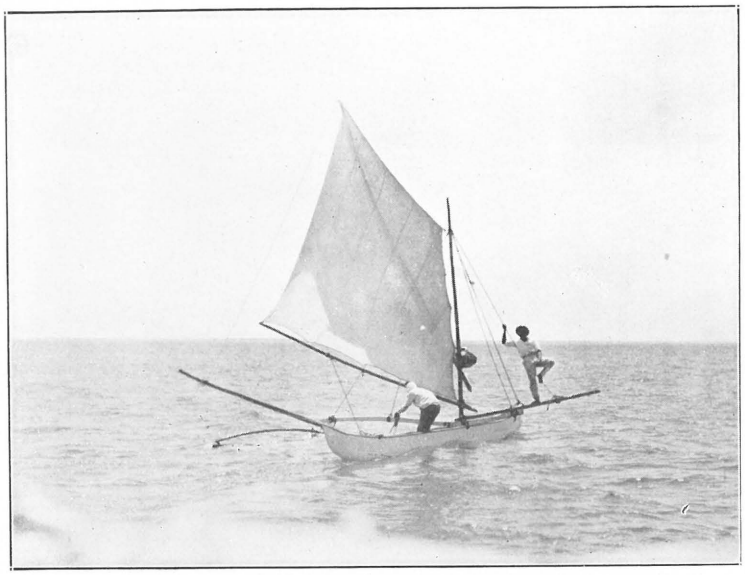
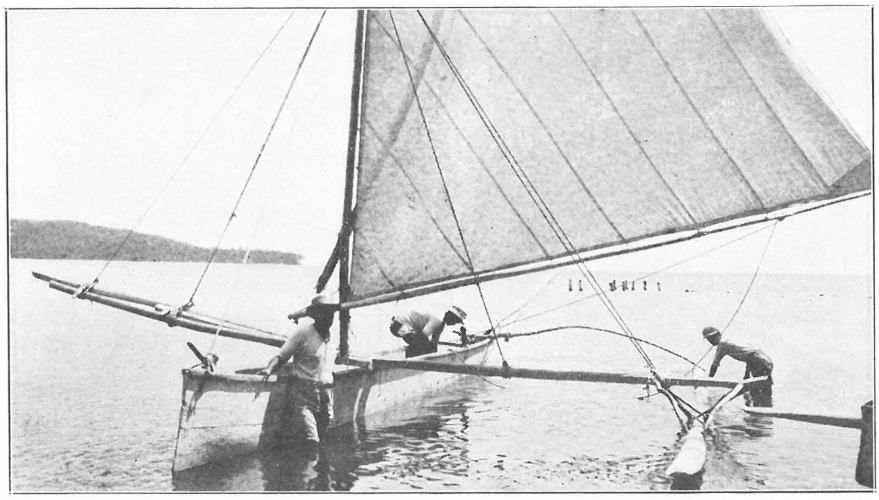


B

DETAILS OF CANOES: *A*, DRAWING OF TAHITIAN SAILING CANOE MADE IN 1792 BY LIEUT. G. TOBIN (REPRODUCED FROM LEE'S "CAPTAIN BLIGH'S SECOND VOYAGE TO THE SOUTH SEAS," SHOWING OUTRIGGER, EXTENDED BOW, RAISED STERN, MAST, AND SAIL; *B*, MODERN CANOE FROM THE LEEWARD ISLANDS, SHOWING MANNER OF RAISING OUT OF WATER WHEN NOT IN USE.

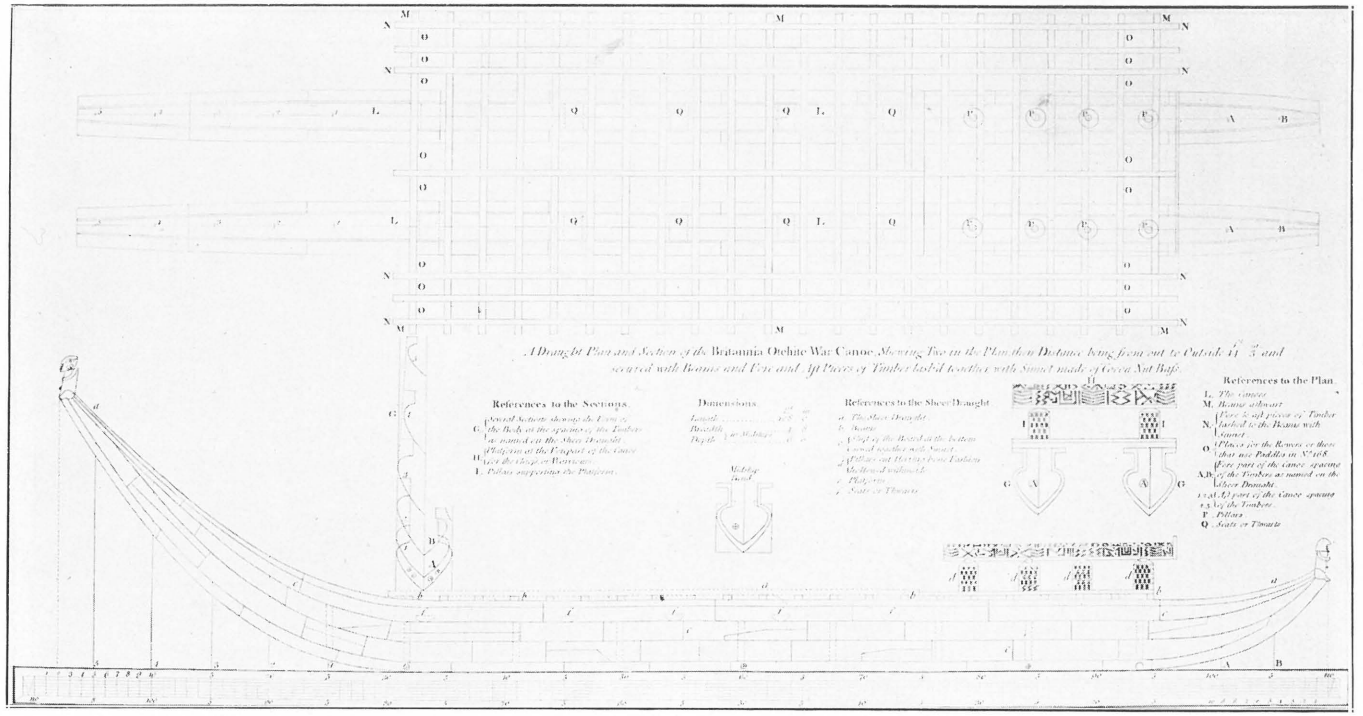


A

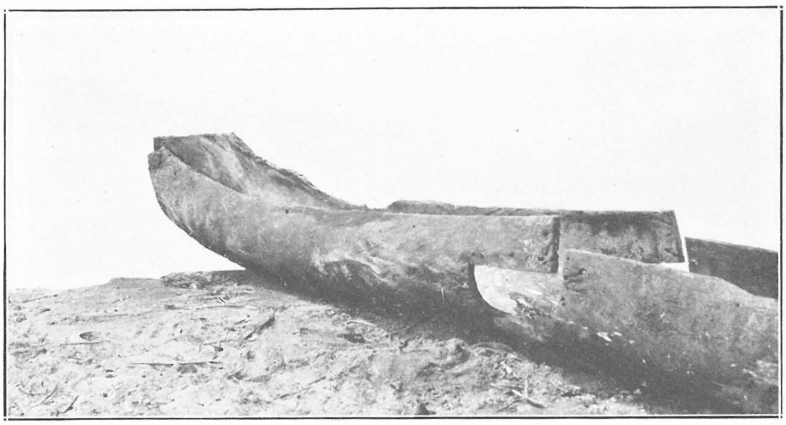


B

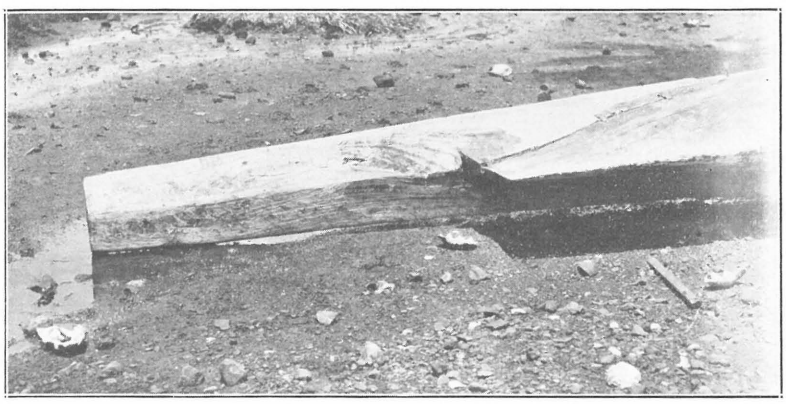
SAILING CANOES (PAHI) OF THE LEEWARD ISLANDS: *A*, MANNER OF BALANCING WHEN UNDER SAIL BY STANDING ON SPRIT; *B*, DETAILS OF PARTS AND RIGGING.



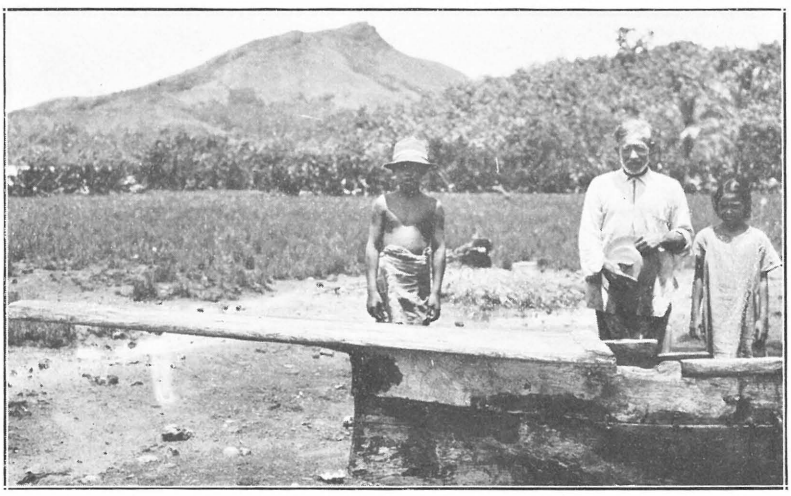
PLAN OF OLD TAHITIAN WAR CANOE WITH TWIN HULLS, FULL-LENGTH PLATFORM, AND ELEVATED STAGING NEAR THE BOW (REPRODUCED FROM PLATE XV, ATLAS, COOK'S SECOND VOYAGE, 1772-75).



A

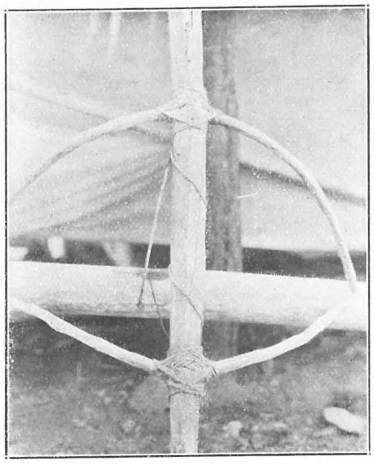


B



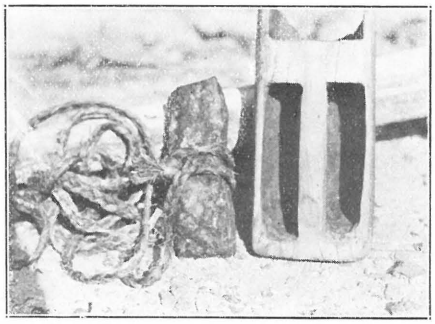
C

REMAINS OF OLD HUAHINE CANOE FOUND AT VAIRIRI: *A*, REAR SECTION OF A HULL; *B*, UNDERSIDE OF BOW-PIECE; *C*, SIDE VIEW OF BOW-PIECE.



A

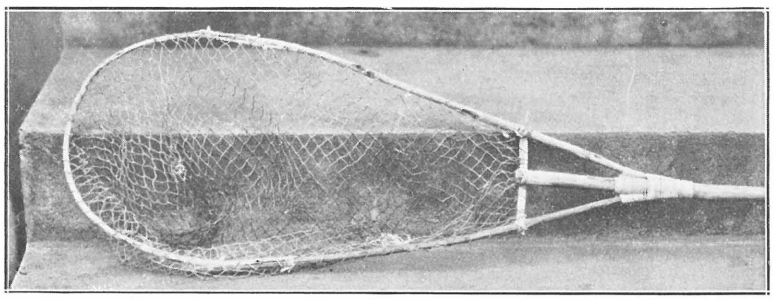
B



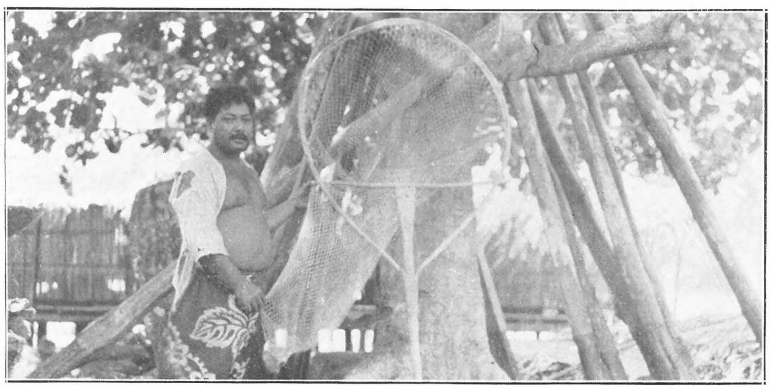
C

CANOE LASHING AND EQUIPMENT: *A*, LASHINGS OF FORWARD OUTRIGGER SUPPORT AND ATTACHMENT TO FLOAT, MOOREA; *B*, STEERING PADDLE FOR SAILING CANOE, RAIATEA; *C*, ANCHOR WITH ROPE OF PLAITED HAU BAST, AND BAILER, MAUPITI.

A

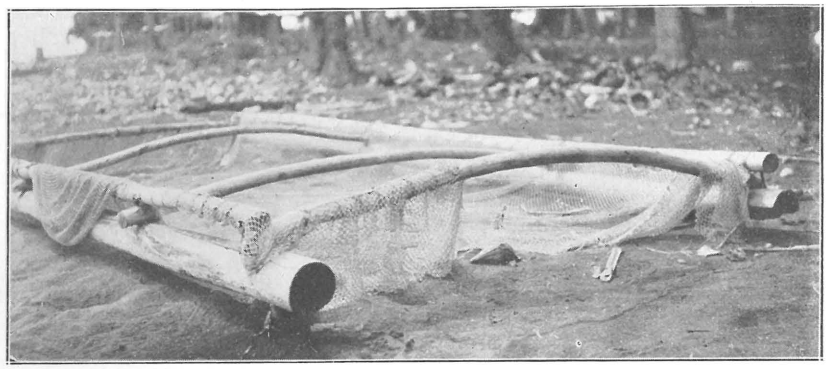


B

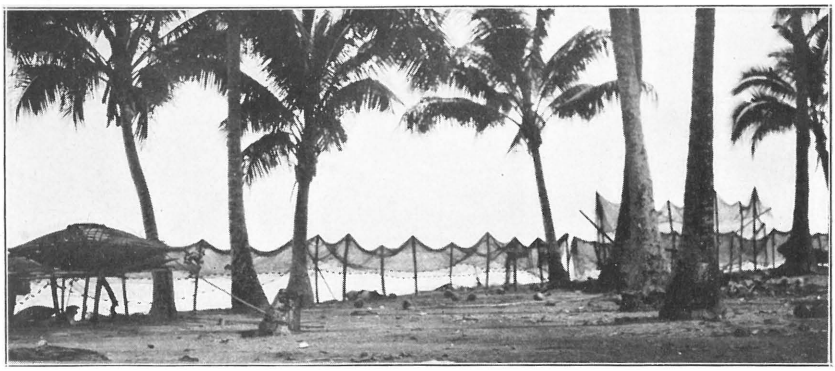


C

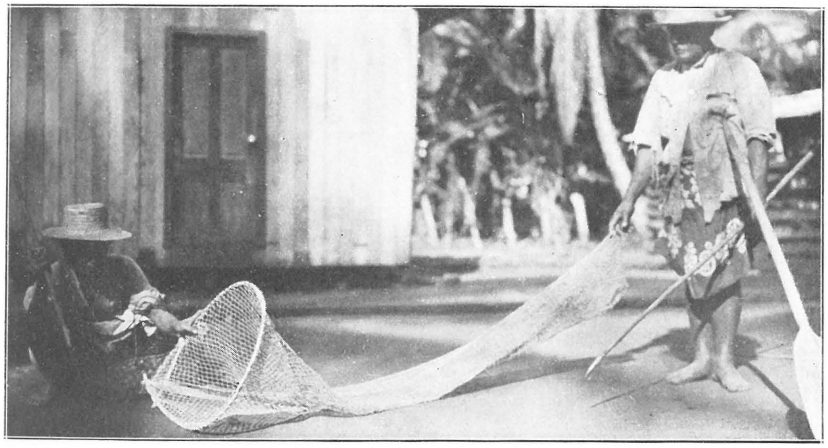
FISHING NETS: *A*, DRYING SEINES AT FAATOAI, MOOREA; *B*, LANDING NET USED FOR SCOOPING UP FLYING FISH, PUNAAUIA, TAHITI; *C*, LANDING NET FOR USE IN FISH TRAPS AT MAEVA, HUAHINE.



A

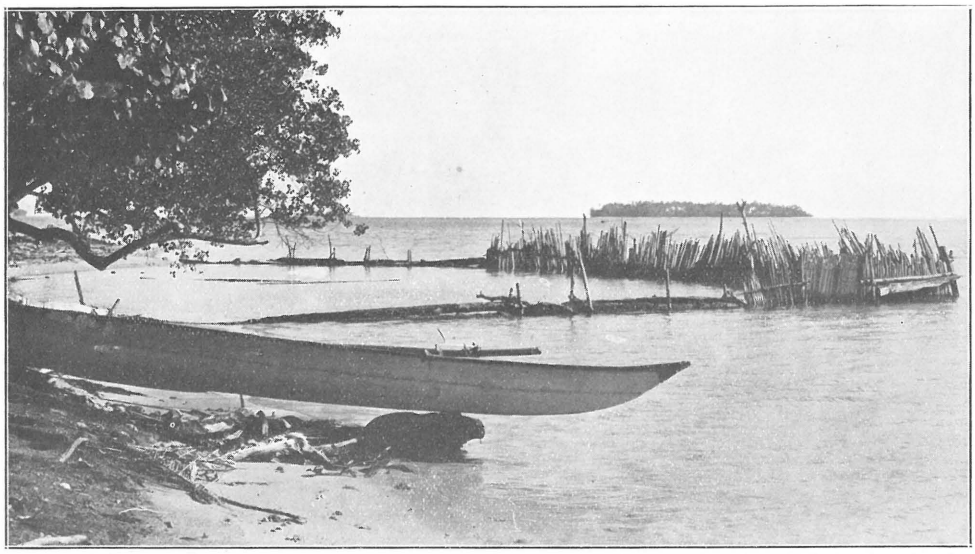


B

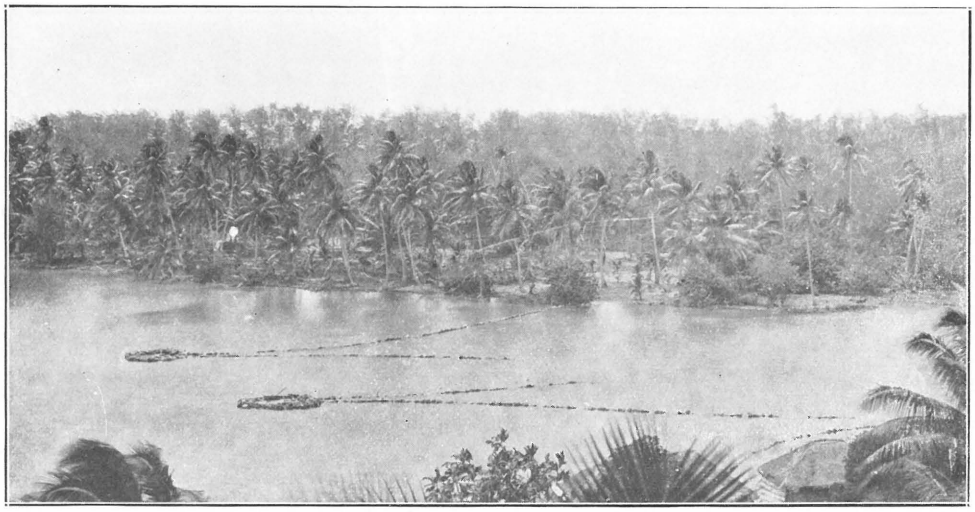


C

FISHING EQUIPMENT: *A*, FLOATING NET CONTAINER, TAUTIRA, TAHITI; *B*, SEINES DRYING, AND BAMBOO FISH CONTAINERS (HAA PEE), PAEA, TAHITI; *C*, DEEP BAG NET, PAPARA, TAHITI.

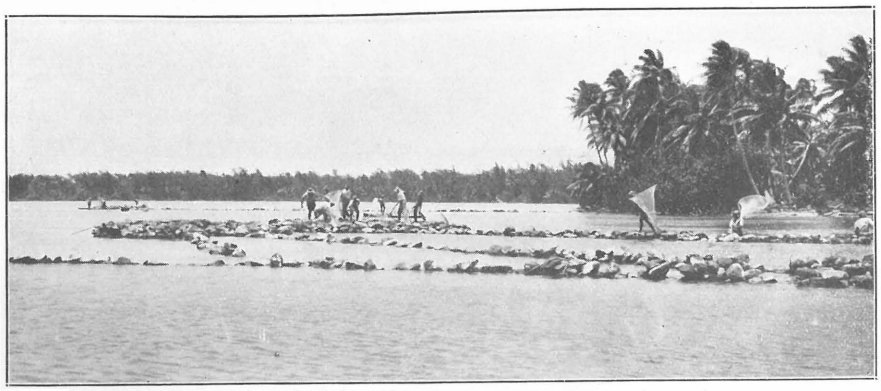


A



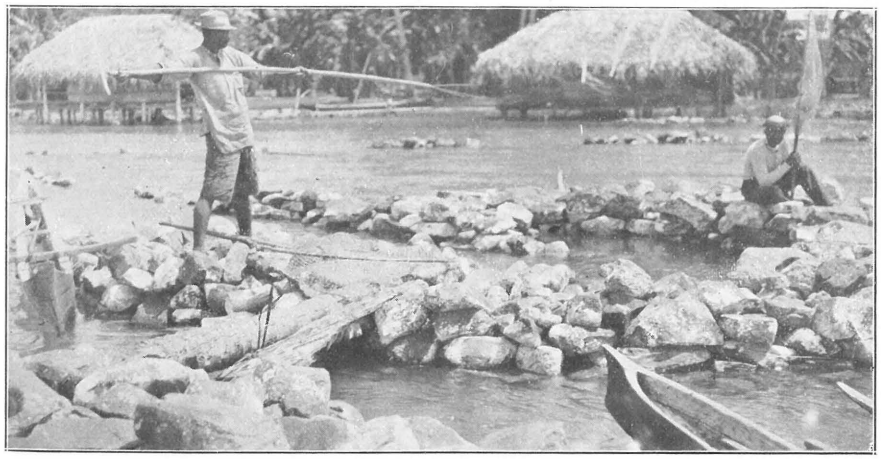
B

FISHPOND AND TRAPS: *A*, ENCLOSURE MADE OF STAKES FOR OPERU FISH (AU'A OPERU) AT TEREIA POINT, BORABORA; *B*, WEIRS AND TRAPS AT MAEVA, HUAHINE.



A

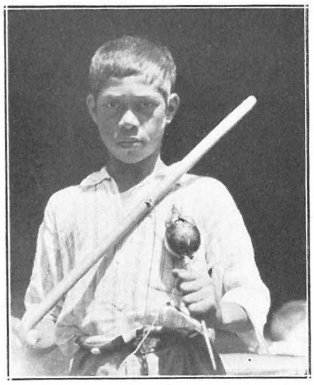
B



C

WEIRS, TRAPS, AND POND IN THE LAGOON AT MAEVA, HUAHINE: *A*, THE WEIR TRAPS NAMED TAHIVEREVERE (LEFT) AND WAHAMOA (CENTER); *B*, SMALL STONE FISHPOND BESIDE DWELLING; *C*, MAN WITH FISHING SPEAR STANDING ON THE TRAP NAMED PUAAOVIRI, WHICH IS CONNECTED WITH THE TRAP NAMED TEPUA BY THE COCONUT-TRUNK BRIDGE.

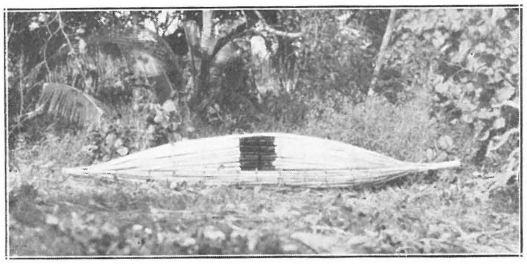
A



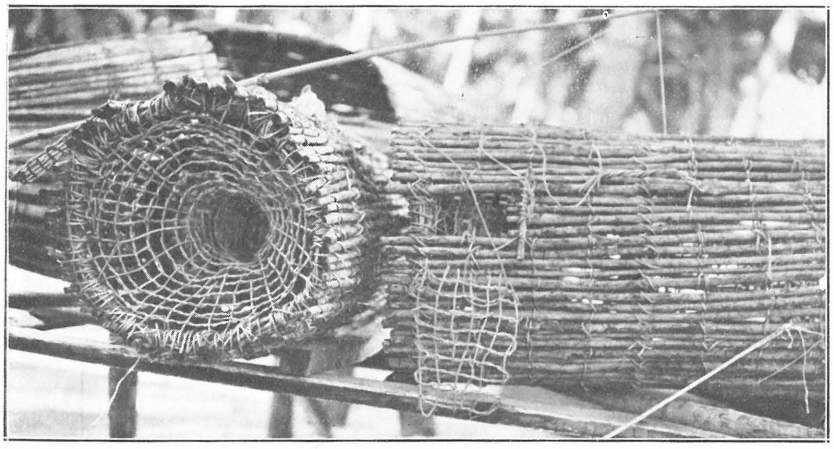
B

FISHING APPARATUS: *A*, BASKETLIKE BAG-NET TRAP (TOTO), TEVAITOA, RAIA-TEA;; *B*, OCTOPUS LURE (FE'E), TEMAE, MOOREA.

A



B



C

CONTAINERS: *A*, CONTAINER MADE WITH FERN STALKS (HAAPEE AANUWHE), USED WITH THE ALBACORE CRANE (TIRA) AT MAUPITI; *B*, LARGE FISH CONTAINER (HAAPEE) MADE OF BAMBOO, PAPARA, TAHITI; *C*, LOBSTER TRAPS (FAA), PUNAAUIA, TAHITI.